DOCUMENT RESUME

ED 291 866 CE 048 906

AUTHOR	Cackler, William
TITLE	A Farm Management Problem. Teacher Guide. AGDEX 810.
INSTITUTION	Ohio State Univ., Columbus. Agricultural Curriculum Materials Service.
SPONS AGENCY	Ohio State Dept. of Education, Columbus. Agricultural Education Service.
PUB DATE	86
NOTE	73p.; For a related student workbook, see CE 048 905.
AVAILABLE FROM	Ohio Agricultural Education Curriculum Materials Service, 2120 Fyffe Road, Room 254, Columbus, OH 43210-1099.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	Agribusiness; *Agricultural Education; *Agricultural Production; Agricultural Supplies; Behavioral Objectives; *Budgeting; Cost Estimates; Equipment Utilization; Facility Planning; Farm Accounts; *Farm Management; Learning Activities; Lesson Plans; Life Cycle Costing; Secondary Education; *Simulation; *Vocational Education
IDENTIFIERS	Ohio

ABSTRACT

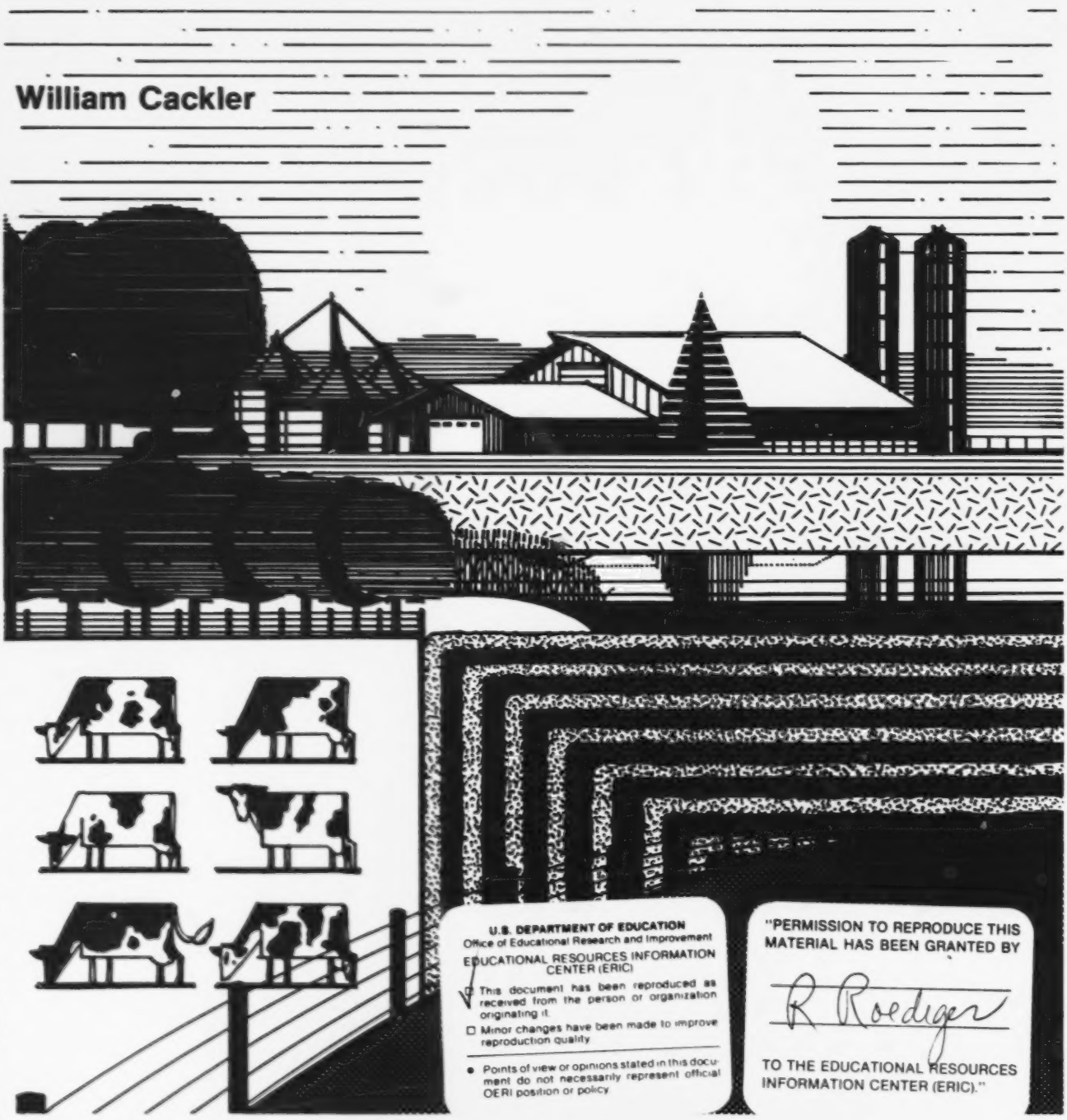
This guide is intended to assist teachers in conducting a farm management simulation that has been designed to help vocational agriculture students acquire competency in both crop and livestock farming. The introductory section includes an overview of the simulation, planning considerations and suggested grading criteria, and a suggested sequence for developing the farm management problem (including a discussion of student choices, recommendations concerning the use of reference materials, and possible changes that individual instructors can make in the simulation). The first unit consists of crop production data on the following: liming, corn, soybeans, small grains, forages, harvest management, seeding mixtures and rates, pasture, and suggested rates and dates of seeding important Ohio crops. The following livestock production data are included in unit II: nutrient composition of feed stuffs commonly fed to cattle and sheep; metabolizable energy, vitamin, and mineral contents of swine feeds; average nutrient composition of feeds commonly used in horse rations; guidelines in selecting rations for dairy cattle, beef cattle, sheep, swine, horses, and poultry; space requirements for livestock, poultry, and horses; and breeding recommendations. Unit III consists of equipment and supplies cost data, including building and equipment costs for livestock, equipment costs and custom hire rates, acre-hours for tillage implements and other equipment, costs of farm supplies, and marketing data. Fourteen transparency masters are included in the fourth unit. (MN)

AGDEX 810

A FARM MANAGEMENT PROBLEM

Teacher Guide

William Cackler



ED291866

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

R Roediger

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE

Agricultural Education Service
State Department of Education

and

Department of Agricultural Education
The Ohio State University

BEST COPY AVAILABLE

James E. Cummins, Director
Agricultural Education Service
State Department of Education

Roger D. Roediger, Director
Ohio Agricultural Education
Curriculum Materials Service

Copyright ©, 1986

Ohio Agricultural Education Curriculum Materials Service
The Ohio State University

All rights reserved

Ohio Agricultural Education Curriculum Materials Service
The Ohio State University
Room 254, 2120 Fyffe Road
Columbus, Ohio 43210-1099

1986

The inclusion of herbicide recommendations in this manual is purely to ***provide information*** *that can be used in working out this farm management problem. These recommendations, taken directly from the* **Ohio Agronomy Guide**, *are based on results of research at the Ohio Agricultural Research and Development Center, other state agricultural experiment stations, and the U.S. Department of Agriculture. No product endorsement or discrimination is intended, nor is any responsibility assumed for actual use of the products.*

The Ohio Agricultural Education Curriculum Materials Service, as a part of The Ohio State University, is an equal opportunity employer and does not discriminate against any individual for reasons of race, color, creed, religion, national origin, or sex. All instructional materials provided by the Ohio Agricultural Education Curriculum Materials Service are available on a non-discriminatory basis without regard to race, color, creed, religion, national origin, or sex.

CONTENTS

Preface and Acknowledgments ii
The Overview - Planning Ahead 1
Grading 1
Suggested Sequence for Developing the Farm Management Problem 2

Unit I. Crop Production Data 5
- Liming 6
- Corn 7
- Soybeans 14
- Small Grains 24
- Forages 24
- Harvest Management 25
- Seeding Mixtures and Rates 26
- Pasture 27
- Suggested Rates and Dates of Seeding Important Ohio Crops 29

Unit II. Livestock Production Data 30
- Nutrient Composition of Feed Stuffs Commonly Fed Cattle and Sheep 31
- Metabolizable Energy, Vitamin, and Mineral Content of Swine Feeds 34
- Average Nutrient Composition of Feeds Commonly Used in Horse Rations 35
- Guidelines in Selecting Rations for:
  - Dairy Cattle 36
  - Beef Cattle 38
  - Sheep 38
  - Swine 39
  - Horses (Mature) 39
  - Poultry 40
- Space Requirements for:
  - Livestock 41
  - Poultry 43
  - Horses 43
- Breeding Recommendations 44

Unit III. Equipment and Supplies Cost Data 46
- Buildings and Equipment Cost for Livestock 47
- Equipment Cost and Custom Hire Rates 48
- Acre-Hours for Tillage Implements and Other Equipment 49
- Cost of Farm Supplies 50
- Marketing Data 51

Unit IV. Transparency Masters ..... following 52
1. Lime Requirements to Increase Soil pH to Four Levels
2. Equivalent Amounts of Liming Materials
3. Adjustments in Liming Ration for Depth of Plowing
4. Examples of Nitrogen Recommended for Corn
5. Examples of Phosphorus Recommended for Corn
6. Examples of Potassium Recommended for Corn
7. Buildings and Equipment Cost for a Farm Operation
8. Equipment Cost
9. Custom Hire Rates
10. Acre-Hours for Tillage Implements and Other Equipment - Part I
11. Acre-Hours for Tillage Implements and Other Equipment - Part II
12. Cost of Farm Supplies - Part I
13. Cost of Farm Supplies - Part II
14. Marketing Data

PREFACE

The farm management problem is designed for vocational agriculture students who require competency in both crop and livestock farming. The author has felt a need existed for some type of farm management problem or simulation that would be completed at or near the end of the student's vocational agriculture problem.

Students typically receive training in topic areas such as crops, soils, fertility, tillage, livestock selection, livestock feeding, and others. However, very little opportunity is afforded to put this training into a complete farm management problem, integrating all the areas. The author believes that completion of the farm management problem will give each student a better understanding of a commercial farming operation and its management.

A Farm Management Problem consists of a *Teacher Guide* and a *Student Workbook*. The teacher guide will provide you with the data, transparency masters, and other helpful information needed to work with your students. The student workbook provides a format for the students to plan and report information on their farm management problem. You will also find the student workbook helpful in the evaluation and grading of the students' work.

ACKNOWLEDGMENTS

Invaluable help and guidance were given to the writer in an overall review of *A Farm Management Problem* for accuracy and clarity by Dr. Roger Roediger, Director of the Ohio Agricultural Education Curriculum Materials Service and director of this project.

Technical assistance during the preparation of the manuscript was provided by Erdal Ozkan, Associate Professor, Department of Agricultural Engineering, The Ohio State University.

Rough draft typing of the manuscript was done by Donna Cackler. Jerry King executed the art work for the cover. Editing and layout were done by Muriel King, and the phototypesetting was done by Jacqueline Stuts.

Much information for both the teacher guide and the student workbook was lifted verbatim from the sources listed below and is used with permission. (Acknowledgment of each source so used is included at the bottom of the appropriate page.)

1) *Livestock Nutrition and Feeding*, Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, 1979.

2) *Livestock Breeding*, Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, 1979.

3) *Ohio Agronomy Guide*, Cooperative Extension Service, The Ohio State University, Columbus, 1985.

4) *The Farm Management Guide*, 15th edition, Doane-Western, Inc., St. Louis, MO, 1982.

5) Gillespie, James, *Modern Livestock and Poultry Production*, Delmar Publishers, Albany, NY, 1981.

THE OVERVIEW — PLANNING AHEAD

Questions you may want to consider when planning ahead for the farm management problem:

Q: *How much time should I plan on for this unit?*

Most students would be able to complete this unit in 3 to 4 weeks of 50-minute class periods.

Q: *Should work be completed outside the classroom?*

As will be explained later under "Instructor's Recommendations for the Use of Reference Materials," you as instructor may choose to have the students complete the study either inside or outside the classroom.

Q: *How much instruction or help will the students need from me during this unit of instruction?*

As this unit would be studied at the end of their vocational agriculture program, the students should have enough general knowledge of farming and farm business at this time to complete the farm management problem with a minimum of instruction. Your role at this point should be one of guidance. Examples include helping with reference materials and giving ideas on planning the farm management problem.

As the instructor your involvement should include:

1. Instruction in getting started, the rules for the farm management problem, and use of the student workbook.
2. Suggestions regarding the recommended reference materials, which items to use, and how to use them. Overheads have been provided in the teacher's guide to help you with this task.
3. Review of the price list for the farm supplies the students will be working with. You may want to work out a sample problem on items of herbicide and fertilizer cost, or work a complete budget as a review.

GRADING

A good educational experience, recommended for all students after completion of their farm simulation, is to present the results to their classmates. They can then defend their reports against their classmates' questions and your questions. This can be a real learning experience for both the presenter and the students doing the questioning.

Avoid basing the grade on total profit from the farm management problem. Look instead at:

1. Crop rotation
2. Tillage and harvest planning
3. Herbicide programs
4. Budgeting

SUGGESTED SEQUENCE FOR DEVELOPING THE FARM MANAGEMENT PROBLEM

I. STUDENT'S CHOICES

In order to put some variation into the farm management problem, and to make each student's farm management problem *one of a kind*, consider the following suggestions.

A. Each student selects a **livestock enterprise.**

Develop your own list of animal enterprises for the students or use the following list. The recommended goal is for each student in the class to have a different animal enterprise so that each student's farm management problem will be unique. The selections can be made by your assigning an enterprise to a particular student, or by having the students draw numbers. For example, for a class of 15 students, use 15 numbers. The student drawing number 1 gets first pick from the list, and so on. Or you can use some other selection process.

Suggested Animal Enterprises

Dairy - dairy cows
dairy heifers
veal calves

Beef - feeder calves 650 to 1,050 lb.
background calves 450 to 650 lb.
cow and calf

Hogs - feeder pig, confinement, high investment (new modern building)
feeder pig, pasture, low investment (probably older building)
finishing
farrow to finish, pasture system
farrow to finish, confinement

Poultry - layers
broilers
turkeys

Sheep - ewe and lamb
feeder lamb

B. Students select the **type of farm:** hill or flat.

As each student lays out plans in the student workbook, he or she should first consider the economic implications of the land as related to his or her livestock enterprise.

For example:

- High demand for corn with a market hog operation is better met with use of a flat farm.
- High demand for pasture and hay with a cow-calf operation can be met with use of a hill farm.
- It may be difficult to justify a cow-calf operation on class I and II land that could cost between $70 and $90 per acre per year to rent or purchase.

C. Students develop **field plans**.

Selection of the crops that are to be grown in each field should be based on the needs of the livestock the student has selected and on current crop prices.

For example:

- If oats are bringing only $1.25 per bushel, it may be wise to put in the field some crop that could produce more profit than oats.
- Market hogs need corn for feed. Usually it does not pay to raise some crop besides corn and then buy grain off the farm and truck it in for feed.

D. Students develop a **4-year crop rotation plan** based on acceptable crop management practices.

For example:

A student has a dairy operation and is feeding high moisture corn and haylage. The student wants to rotate a poor stand of alfalfa back to a new stand of alfalfa. The solution may be like this.

First year: No-till corn, with Paraquat and Atrazine used for weed control.

Second year: Soybeans as a cash crop, with careful planning as to herbicide use.

Third year: Wheat, again with careful herbicide planning if alfalfa is to be reseeded in the late summer.

E. Students develop a **fertilizer program** based on soil test results and yield goals.

Students will use the information from the flat or hill farms and work with charts in the teacher's guide or the *Ohio Agronomy Guide* to calculate their fertilizer needs for a crop. Then they will record this information in the student workbook on the crop report sheets. Next they will use the price list in the back of this guide to calculate the cost they will use in their budgets in the student workbook or on the computer.

F. Students develop a **weed control program.**

The weed control program should be based on the nature of the weed problem given for the flat or hill farm in the farm management problem student workbook. The weed problem is placed in each field to force students to plan on using different herbicides when confronted with different weeds. Each student also needs to plan a general herbicide program for each field. This information is recorded by the student on the crop reporting sheet in the student workbook.

For example:

A field of corn has Canada thistles. If a student uses Atrazine plus Lasso or Dual, he or she will get poor Canada thistle control in preplant or preemergence application methods. The student may have to make a repeat treatment with Banvel postemergence to get good control on this problem.

G. Students develop **crop and livestock budgets.**

The rules on budgeting are outlined on the rules page in the farm management problem student workbook. When this is completed, the student will have a good idea of what it costs to produce a crop, a head of livestock, or a product from the livestock. The budgets can be done by the student with a computer, or the student can use the ones in the student workbook.

II. INSTRUCTOR'S RECOMMENDATIONS FOR USE OF REFERENCE MATERIALS

In this teaching guide, many sources of data have been provided for you, the instructor. The intent of this teaching guide is to provide you with an *outline* of the types of data the student will need to complete the farm management problem. Several samples of data are provided for you as overheads to help you instruct your students on the use of the different data tables.

You may want to copy the data in this teaching guide for student use in preparing the farm management problem. However, **you are strongly urged to use the sources of data that the students have been familiar with throughout their vocational agriculture program.** Use by the students of familiar reference materials tends to **shorten the time required for completion** of the farm management problem. Also, the students should be **using reference materials that they will have access to** when they are out of school and in farming or agribusiness.

As instructor, you will need to consider how the reference materials will be used and controlled. It is advised to limit the students' use of the reference materials to class time. Control at that time is much easier for you. You can minimize the amount of material you need, and you do not need to use a sign-out system. Even when the students are to work on their projects in study hall or for homework, they can obtain the needed data while in class and make their calculations later. At the introduction of this unit, you can illustrate to the students how this can be done.

Suggested Reference List
(for class of 15 students)

15 *Ohio Agronomy Guide* or *Crop Production* books

3 *Livestock Nutrition and Feeding* student manuals

1 *Livestock Breeding* student manual

1 Doane's *The Farm Management Guide*

1 *Livestock Enterprise Budgets*

1 *Crop Enterprise Budgets*

Note: Estimated cost of all the above references, ordered from the Ohio Agricultural Education Curriculum Materials Service, is $65.00 - $75.00.

III POSSIBLE CHANGES BY THE INSTRUCTOR

There are changes you as instructor could make to adapt the farm management problem to a given situation in your area. Most of these changes could be done on the farm layout page of the student workbook.

A. Change soil test to match your soil conditions.

B. Change weed problems to match your area.

C. Change field layout or land class to match fields in your area.

D. Change acreages to match fields in your area.

E. Have students develop a marketing plan for the crops and livestock.

F. Have students calculate equipment and building costs.

Note: Keep in mind that this farm management problem is designed for a class that is 50 minutes long per day, running for 3 to 4 weeks. If changes E and F are used, the farm management problem could be lengthened by 1 to 2 weeks.

UNIT I

CROP PRODUCTION DATA

A. In this unit, data will be provided for you to use with your students. These data will help them complete the crop reporting sheets and crop budgets in the farm management problem. (*Other sources of data can be used if you so desire.*)

B. It is suggested that you make this information or comparable information available to your students in the vo ag department.

C. The sources of data for this unit include:

Excerpts from the *Ohio Agronomy Guide* (Bulletin 472, 1985 revision, Ohio Cooperative Extension Service)

Liming - pages 18-19

Corn - pages 23-24, 31-38

Soybeans - pages 48-58

Small Grains - pages 41-42

Forages - pages 62-67

Pasture - pages 74-75

Suggested Rates and Dates of Seeding - inside back cover

LIMING

Determination of Lime Requirement - The soil pH test measures active soil acidity or alkalinity. The lime requirement is determined by the lime test index, which measures total exchangeable soil acidity. The lower the lime test index is below 68, the higher the lime requirement. The following table shows the relationship between lime test index and lime requirements to different soil pH levels.

Lime Requirements to Increase Soil pH to Four Levels
(in terms of T/A ag-ground limestone, T.N.P. 90+, 8 inch plow depth)

Lime Test Index	pH Levels: Mineral Soils 7.0	Mineral Soils 6.5	Mineral Soils 6.0	Organic Soils 5.2
	Tons per Acre—Ag-Ground Limestone			
68	1.4	1.2	1.0	0.7
67	2.4	2.1	1.7	1.3
66	3.4	2.9	2.4	1.8
65	4.5	3.8	3.1	2.4
64	5.5	4.7	3.8	2.9
63	6.5	5.5	4.5	3.5
62	7.5	6.4	5.2	4.0
61	8.6	7.2	5.9	4.6
60	9.6	8.1	6.6	5.1
59	10.6	9.0	7.3	5.7
58	11.7	9.8	8.0	6.2
57	12.7	10.7	8.7	6.7
56	13.7	11.6	9.4	7.3
55	14.8	12.5	10.2	7.8
54	15.8	13.4	10.9	8.4
53	16.9	14.2	11.6	8.9
52	17.9	15.1	12.3	9.4
51	19.0	16.0	13.0	10.0
50	20.0	16.9	13.7	10.5
49	21.1	17.8	14.4	11.0
48	22.1	18.6	15.1	11.6

These values must be adjusted for type of material, plow depth and lime credit.

The reason for different ratings based on particle size is the difference in surface. The finer the liming materials, the greater the surface area and the faster it reacts with acid soil. Extremely coarse material, i.e., larger than 8-mesh, is not considered because it reacts slowly in the soil.

The total neutralizing power (T.N.P.) of liming materials has a wide range. This range is due to the variations in the percentage of calcium and/or magnesium and impurities, such as silt and clay, contained in the limestone. When the T.N.P. of the liming material is less than 90, an adjustment should be made to account for this lower T.N.P.

Source: *Ohio Agronomy Guide*, pp. 18-19

Equivalent Amounts of Liming Materials
(based on T.N.P. and fineness)

Grade	T.N.P.	Fineness % Passing Mesh Size 100	60	20	8	Pounds to equal 1 ton of Agr'l Ground Limestone 90 or higher T.N.P.	% of Ag-Ground to Apply
AGRICULTURAL LIMESTONES AND/OR SLAG (air cooled)							
Hydrated	160+	90	95	98	100	1000	50
Hydrated	130-140	"	"	"	"	1200	60
Ag-Superfine	90+	80	95	100	100	1600	80
	80-89	"	"	"	"	1800	90
Ag-Pulverized	90+	60	70	95	100	1700	85
	80-89	"	"	"	"	1900	95
Ag-Ground (Base)	90+	40	50	70	95	2000	100
	80-89	"	"	"	"	2300	115
Ag-Fine Meal	90+	30	40	60	85	2500	125
	80-89	"	"	"	"	2800	140
Ag-Coarse Meal	90+	20	30	50	80	2900	145
	80-89	"	"	"	"	3200	160
Ag-Fine Screenings	90+	10	20	45	80	3400	170
	80-89	"	"	"	"	3800	190
Ag-Coarse Screenings	90+	5	15	40	80	4000	190
	80-89	"	"	"	"	4300	215
AGRICULTURAL GRANULATED SLAG (water cooled)							
Ag-Granulated Slag	90+	10	15	60	95	2000	100
	80-89	"	"	"	"	2300	115

Adjust for Depth of Plowing - If plowing will be to a depth of 9 inches instead of 8 inches, additional lime will be required to react with the larger volume of soil involved.

The 9-inch plowing depth is given in the following table, and the factor 1.13 is listed in the right column. The 5 tons per acre is multiplied by 1.13 to determine the amount of lime to apply (5 x 1.13 = 5.65). In this example, 5.65 tons per acre should be applied. Depth of plowing adjustments will be made on your soil test form if the depth of plowing is noted on the soil information sheet sent to the Research-Extension Analytical Laboratory (REAL).

Adjustments in Liming Ration for Depth of Plowing

Plowing Depth (in)	Multiplying Factor
3	.38
6	.75
7	.88
Base 8	1.00
9	1.13
10	1.25
11	1.38
12	1.50

CORN

Fertilizer Recommendations

Fertilizer recommendations are listed in separate tables for N, P_2O_5, and K_2O, in the production practices of each crop.

To estimate the amount of phosphorus needed in the annual recommendation for corn, the following assumptions will be used - yield goal of 150 bushels per acre and a soil test value of 15 pounds P per acre. In Table 1, the yield goal falls under the 150 bushels per acre column and the 15 pounds P per acre is between the 10 and 20 pounds per acre. The values in the table are as follows:

	150 bu/A
10 lbs. P/A	100
20 lbs. P/A	80

The soil test of the example of 15 pounds per acre is halfway between 10 and 20; therefore the P_2O_5 recommendation is halfway between 100 and 80 or **90 pounds P_2O_5** per acre.

Similarly, to estimate the amount of potassium needed, the following assumptions will be used - yield goal 150 bushels per acre, soil test value of 200 pounds K per acre and a CEC of 15. In Table 2, the yield goal falls under the 150 bushels per acre column, the soil test value of 200 pounds K per acre is halfway between 150 and 250 in the pounds K per acre column, and the CEC of 15 is halfway between the 10 and 20 CEC columns. The values in the table are as follows:

	150 bu/A		
	C.E.C.		
lb K/A	10	20	30
150	**90**	110	
250	**50**	70	

After calculating for a CEC of 15, this segment of the table would be as follows:

lb K/A	C.E.C. 15
150	100
250	60

Then to determine the annual recommendation of K_2O per acre for a 200-pound K per acre soil test value, simply find the midpoint between 100 and 60 or **80 pounds K_2O** per acre.

Table 1. Examples of Phosphorus (expressed as lb P_2O_5/A) **Recommended for Corn** (Broadcast Program)

Soil Test Value	Yield Goals (Bu/A) 120	150	180
lb P/A	Annual Recommendation		
10	75	100	110
20	65	80	90
30-60	**45***	**60**	**70**
70	25	40	50
80	20	20	30
90	0	0	20
100	0	0	0

*Boldface numbers are the approximate amounts of crop removal.

Table 2. Examples of Potassium (expressed as lb K_2O/A) **Recommended for Corn** (Broadcast Program)

Soil Test	Yield Goals (Bu/A) 120 C.E.C.			150 C.E.C.			180 C.E.C.		
Value	10	20	30	10	20	30	10	20	30
lb K/A	Annual Recommendation[1]								
50	120	140	160	130	150	170	140	160	180
150	80	100	120	90	110	130	100	120	140
250	40	60	80	50	70	90	60	80	100
350	**30***	**30**	40	**40**	**40**	50	**50**	**50**	60
450	0	20	**30**	0	30	**40**	20	40	**50**
550	0	0	0	0	0	0	0	0	20

*Boldface numbers are the approximate amounts of crop removal.

Table 3. Examples of Nitrogen Recommended for Corn

Previous Crop	Yield Goals (Bu/A) 120	150	180
	Annual Application lb N/A		
Forage Legume	60	110	150
Grass Crop	85	170	200
Soybeans	85	190	200
Continuous Corn and Other Crops	115	200	200

Plant Populations

In general, a final plant stand of 24,000 plants per acre will produce optimum yields in Ohio; however, some hybrids may require higher populations to achieve their yield potential. Rely on the advice of your seed producer regarding the plant populations recommended for the hybrids being grown.

Plant population recommendations are based on the stand at harvest. In general, there is a decrease of 10 to 15 percent from planter manual setting for seed drop per acre and the resulting stand of corn at harvest. To obtain the recommended harvest stand, it is suggested that the planter be set to drop 20 percent more seeds than the desired stand for plant population below 20,000 plants per acre. For plant populations above 20,000, set the planter to drop 10 percent more seeds than the recommended harvest stand.

Source: *Ohio Agronomy Guide*, pp. 23-24, 31-32

CORN *(continued)*

Weed Control

Soil residues of the persistent triazines, atrazine, and simazine may remain in the soil and injure susceptible crops following corn. Do not use any atrazine or simazine if a crop other than corn or sorghum is to be planted the same growing season. This includes small grain in the fall following corn. On areas to be seeded to oats, alfalfa, clover and forage grasses the following spring, use no more than 0.8 lb/A active (1 lb/A 80 WP, or 0.9 lb/A of DF Nine-O, 0.8 qt/A of 4L) of atrazine and/or simazine. On areas to be planted to soybeans or sunflowers the following year, use no more than 1.6 lb/A active (2 lb/A of 80 WP, or 1.75 lb/A of DF Nine-O, or 1.6 qt/A of 4L).

If the amount of atrazine and/or simazine is to be reduced below that needed for weed control because of anticipated injury to the following crop, Bladex can be added in the amount equal to or slightly higher than this reduction. An example, if 2½ lb/A of atrazine is needed to control the weeds in corn and the area is to be planted to soybeans the next year, reduce the amount of atrazine to 1 to 1½ lb/A and add 1½ to 1¾ lb. Bladex. Also, three-way mixtures such as Bladex-Atrazine-Lasso, Bladex-Princep-Lasso, Bladex-Atrazine-Sutan, Bladex-Atrazine-Dual, and others can be used to reduce the carry-over hazard, yet have enough triazine to assure good weed control.

HERBICIDE RECOMMENDATIONS FOR CORN

Herbicide	Active Ingredient per Acre	Formulated Product per Acre	Water Overall (gal/A)	Remarks
NO-TILLAGE IN SOD				If briars, woody plants and certain other perennial species such as hemp dogbane, milkweed and bindweed are infesting an area planned for no-tillage corn, the best control would be to apply herbicides in the year before going to corn. Herbicides such as dicamba (Banvel), 2,4-D, Roundup, and others could be used.
Atrazine	3 to 4 lb.	80W-3 3/4 to 5 lb. 90DF-3 1/3 to 4 1/2 lb. 4L-3 to 4 qt.	20 or more	Apply before vegetation is more than 6 to 8 inches tall. After heading, meadow grasses are more difficult to kill. Use lower rate of atrazine on bluegrass, timothy, and bromegrass and higher rates on orchardgrass, quackgrass and tall fescue. Also use higher rates as the vegetation becomes more mature. Add ½ pint Banvel per acre to control resistant species such as alfalfa and Canada thistle. If initial control is not satisfactory, 1½ to 2 lb. of atrazine/A plus crop oil in 20 gallons of water can be used to respray the meadow plants even after the corn has emerged. **If an early harvest of meadow** is made and the corn is planted immediately, atrazine 2,4-D and oil will give effective control. Banvel or 2,4-D may be applied post-emergence to control escaped clover, alfalfa and broadleaf weeds if needed. In crop oils, the amount of emulsifier varies, and this, therefore, influences the rate needed. Use the rate suggested on the crop oil label.
plus				
2,4-D amine	1 to 1 1/2 lb.	4 lb/gal.-1 to 1 1/2 qt.		
plus				
Crop Oil	See Remarks			
Atrazine	3 to 4 lb.	80W-3 3/4 to 5 lb. 90DF-3 1/3 to 4 1/2 lb. 4L-3 to 4 qt.	20 or more	**DO NOT APPLY AFTER CORN EMERGES.** This mixture gives a quicker knockdown of grasses (especially when vegetation is more than 6 inches tall) than above mixture but is weak on perennial broadleaf weeds. For perennial broadleaf weeds apply 1 to 2 qt. 2,4-D/A in a separate spray 7 to 10 days before applying the atrazine and Paraquat/Gramoxone. Banvel at 1/2 to 1 pint/A can be substituted for the 2,4-D and can be applied at the same time as the atrazine-paraquat mixture. If broadleaf weeds are a problem after planting corn, 2,4-D and/or Banvel can be used. See Post-Emergence. When using Paraquat/Gramoxone, always use a surfactant.
plus				
Paraquat/Gramoxone (with surfactant)	1/2 lb.	2 pt.		
Atrazine	3 to 4 lb.	80W-3 3/4 to 5 lb. 90DF-3 1/3 to 4 1/2 lb. 4L-3 to 4 qt.	10	**DO NOT APPLY AFTER CORN EMERGES.** This combination gives better control on perennial broadleaf weeds such as Canada thistle and on tough grasses such as orchardgrass, tall fescue and wirestem muhly than atrazine and Paraquat/Gramoxone. Better control can be expected when more foliage is developed on the species to be killed. Do not apply in combination with fertilizer solutions. For maximum activity of Roundup, especially at the 1 qt/A rate, apply atrazine in separate application with at least a 3-day delay.
plus				
Roundup (with surfactant)	3/4 to 1 1/2 lb.	1 to 2 qt. 2 qt/100 gal spray solution		

Source: *Ohio Agronomy Guide*, pp. 33-38

(continued)

Herbicide Recommendations for Corn *(continued)*

Herbicide	Active Ingredient per Acre	Formulated Product per Acre	Water Overall (gal/A)	Remarks
NO-TILLAGE IN CORN STALKS OR OTHER TILLED CROP RESIDUE (ALSO FOR SMALL GRAIN COVER CROP)				
Simazine	2 1/2 to 3 1/2 lb.	80W-3 to 4 1/3 lb. 4L-2 1/2 to 3 1/2 qt. 90DF-2 3/4 to 3 3/4 lb.	20 or more	**DO NOT APPLY AFTER CORN EMERGES.** Annual grasses, especially fall panicum, are usually the major weed problem following clean-tilled crops, especially if atrazine has been used one or more seasons. These treatments will control these grasses. Apply preplant or at planting. Use high rate on soils with organic matter above 3%. On quackgrass use high rate of atrazine plus Simazine plus Paraquat/Gramoxone. For perennial or well established annual broadleaf weeds apply 1 to 2 qt. of 2,4-D per acre 7 to 10 days before the mixtures, or Banvel at 1/2 pt. to 1 pint/A can be applied with the mixtures. Banvel and/or 2,4-D can be applied post-emergence for broadleaf weed control. Susceptible crops may be injured the year following this treatment. When using Paraquat/Gramoxone always use a surfactant. Paraquat/Gramoxone may be omitted if there are absolutely no grasses germinated at time of planting. **Roundup** at 1 to 2 qt/A with 2 qts. of surfactant per 100 gal. spray solution can be substituted for the Paraquat/Gramoxone for better control of perennials such as Canada thistle, quackgrass and orchardgrass. Reduce spray solution to 10 gal/A for better Roundup results.
plus				
Paraquat/Gramoxone (with surfactant)	1/4 to 1/2 lb.	1 to 2 pt.		
-- or --				
Atrazine	1 1/2 to 2 lb.	80W-2 to 2 1/2 lb. 90DF-1 2/3 to 2 1/4 lb. 4L-1 1/2 to 2 qt.		
plus				
Simazine	1 1/2 to 2 lb.	80W-2 to 2 1/2 lb. 4L-1 1/2 to 2 qt. 90DF-1 2/3 to 2 1/4 lb.		
plus				
Paraquat/Gramoxone	1/4 to 1/2 lb.	1 to 2 pt.		
Atrazine	1 1/2 to 2 lb.	80W-2 to 2 1/2 lb. 90DF-1 2/3 to 2 1/4 lb. 4L-1 1/2 to 2 qt.	20 or more	**DO NOT APPLY AFTER CORN EMERGES.** Apply pre-plant or at planting or soon after planting. This treatment will control fall panicum after it has emerged. **Banvel** can be applied with this mixture to control perennial broadleaf weeds. Soil residue not likely to injure susceptible crops the following year. When using **Paraquat/Gramoxone**, always use a **surfactant**. Bicep is a combination of Dual and atrazine. Lasso/atrazine is a premixed combination of Lasso and atrazine. Paraquat/Gramoxone may be omitted if there are absolutely no grasses germinated at time of planting. **Roundup** at 1 to 2 qt/A with 2 qts. of surfactant per 100 gal. spray solution can be substituted for the Paraquat/Gramoxone for better control of perennials such as Canada thistle, quackgrass and orchardgrass. Reduce spray solution to 10 gal/A for better Roundup results. **Bronco** is a premixed combination of Roundup and Lasso and can be used instead of Paraquat/Gramoxone and Lasso.
plus				
Lasso or **Dual**	2 to 3 lb. 2 to 2 1/2 lb.	Lasso-2 to 3 qt. Dual 8E-1 to 1 1/4 qt.		
plus				
Paraquat/Gramoxone	1/4 to 1/2 lb.	1 to 2 pt.		
Bladex (Use alone or in combination with atrazine, Lasso, Dual, paraquat, 2,4-D and/or Banvel. See Bladex label for rates for various combinations.)	2 to 5 lb.	80W-2 1/2 to 6 1/4 lb. 90DF-2 1/4 to 5 1/2 lb. 4L-2 to 5 qt.	25 or more	Bladex applied alone or in combination with atrazine and/or Lasso or Dual will kill most existing small weeds and suppress many emerged perennial weeds when corn is planted into stalk ground (corn, sorghum), stubble ground (soybean, small grains), and any minimum-till situation. This treatment then provides residual control of annual weeds as in conventional tillage. Add ½-1 pt/A of 2,4-D Low Volatile 6 lb. Ester (0.75-1.5 pt/A 2,4-D LV 4 lb. Ester). Add the 2,4-D LV to the spray tank last. Use a minimum of 25 gals/A carrier. Complete spray coverage of the weeds is essential for best performance. Nitrogen solutions and complete liquid fertilizers are the preferred carriers for this treatment as they help aid in the burndown of existing weeds. Add X-77 surfactant at 1-2 qts. per 100 gals. of diluted spray, or other suitable surfactant at its recommended rate. Apply before weeds exceed 3" in height. For control of existing alfalfa add 1/3 to 3/4 pt/A of Banvel to the spray mixture. Apply before the alfalfa exceeds 6" in height. For fields with existing sod grasses such as orchardgrass, bromegrass, rye or timothy, or when very dry conditions exist, or when existing weeds exceed 3" in height add paraquat to the tank-mix. Use 2 pts/A of paraquat in combination with Bladex except the 2,4-D LV may be omitted if desired. Do not apply paraquat in suspension type liquid fertilizer.

14

(continued)

Herbicide Recommendations for Corn *(continued)*

Herbicide	Active Ingredient per Acre	Formulated Product per Acre	Water Overall (gla/A)	Remarks
REDUCED TILLAGE SUCH AS CHISEL, FIELD CULTIVATOR OR DISK ON STALK LAND				
Where the tillage operation(s) does not eliminate all the weeds prior to planting, use one of the treatments in the previous section (No-Tillage--in corn stalks or other tilled crop residue). These treatments will kill the existing vegetation and also give residual control. See the "Remarks" following each treatment for the specifics of the treatments. In most situations, the rate of Paraquat should be only 1 pint per acre.				
CONVENTIONAL TILLAGE-PREPLANT INCORPORATED APPLICATION				
Atrazine	1 1/2 to 4 lb.	80W-1 3/4 to 5 lb. 90DF-1 2/3 to 4 1/2 lb. 4L-1 1/2 to 4 qt.	15 or more	Apply on prepared seedbed prior to planting and incorporate with a disk or other tool which will thoroughly mix the top 2 to 3 inches of soil. May be applied with most liquid fertilizers. Controls most annual grass and broadleaf weeds. Use rate recommended on labels for specific soil type. The lower rates should be used on coarse-textured soils low in organic matter, and the higher rates on heavy clay soils high in organic matter. Do not plant any crop except corn or sorghum the year of application of atrazine or simazine. See the discussion on soil residues at the beginning of this section for information on the possibility of triazine injury to crops following corn. Atrazine is more effective on nutsedge and quackgrass. Bladex and simazine are more effective on fall panicum. Do not use Bladex on sands or loamy sands with an organic matter of less than 1%.
-- or --				
Simazine	1 1/2 to 4 lb.	80W-1 3/4 to 5 lb. 4L-1 1/2 to 4 qt. 90DF-1 2/3 to 4 1/2 lb.		
-- or --				
Bladex	1 1/2 to 4 lb.	80W-1 3/4 to 5 lb. 4L -1 1/2 to 4 qt. 90DF-1 2/3 to 4 1/2 lb.		
-- or --				
Combination of these materials				
Sutan +/Genate Plus	4 to 6 lb.	4 3/4 to 7 1/4 pt.	15 or more	The active herbicides in both Sutan + and Genate Plus is butylate. Apply prior to planting and incorporate within 4 hours. If the delay is more than 30 minutes after application the soil surface should be relatively dry to prevent loss of herbicide. When these herbicides are impregnated on dry fertilizer the incorporation must be done the same day as applied. Thoroughly mix herbicide in the top 3 inches of soil with disk or tillage tool which will uniformly mix the soil. Will control most grass weeds, including **nutsedge, Johnsongrass seedlings** and **wild cane.** Only poor to fair control of most broadleaf weeds. Application of these materials in combination with **atrazine** and/or **Bladex** will control broadleaf and grass weeds. See the discussion at the beginning of this section for information on three-way combination: i.e., Butylate-Atrazine-Bladex. **Sutazine** and **Atrabute** are combinations of butylate and atrazine. Butylate will persist slightly longer than Eradicane; therefore, butylate should be used on early planted corn. Eradicane Extra will have a somewhat longer soil life than Eradicane. In Ohio, Eradicane Extra should be used on johnsongrass, quackgrass and in fields where Eradicane has been previously used. Eradicane Extra at the higher rate will reduce the stand and vigor of established johnsongrass and quackgrass. On johnsongrass, do not apply Eradicane Extra or plant corn before May 5 in Southern Ohio or May 10 in Central Ohio. **Do not use Butylate or Eradicane or Eradicane Extra on corn seed stock.** Some corn hybrids are more susceptible to injury than others.
-- or --				
Eradicane	4 to 6 lb.	4 3/4 to 7 1/4 pt.		
-- or --				
Eradicane Extra	4 to 6 lb.	5 to 8 pt.		
Atrazine	1 1/3 to 2 1/4 lb.	80W-1 2/3 to 2 3/4 lb. 90DF-1 1/2 to 2 1/2 lb. 4L-1 1/3 to 2 1/4 qt.	15 or more	Apply on prepared seedbed prior to planting and incorporate with a disc or other tools which will thoroughly mix the top 2 inches of soil. Do not incorporate deeper. Controls most broadleaf and grass weeds including fall panicum and nutsedge. Use low rates on coarse textured soils low in organic matter. Use high rates on fine textured clay soils which have more than 3% organic matter. See the discussion at the beginning of this section for information on three-way combinations; i.e., atrazine-Bladex-Dual and atrazine-Bladex-Lasso. **Bicep** is a combination of Dual and atrazine and Lasso/atrazine is a premixed combination of Lasso and atrazine.
plus				
Lasso or Dual	2 1/2 to 3 lb. 2 to 2 1/2 lb.	Lasso-2 1/2 to 3 qt. Dual 8E-1 to 1 1/4 qt.		
-- or --				
Bladex	1 to 3 lb.	80W-1 1/4 to 3 3/4 lb. 4L -1 to 3 qt.		
plus				
Lasso or Dual	2 1/2 to 3 lb. 2 to 2 1/2 lb.	Lasso-2 1/2 to 3 qt. Dual 8E-1 to 1 1/4 qt.		

(continued)

Herbicide Recommendations for Corn *(continued)*

Herbicide	Active Ingredient per Acre	Formulated Product per Acre	Water Overall (gla/A)	Remarks
		CONVENTIONAL TILLAGE-PREEMERGENCE APPLICATION		
Atrazine -- or -- Simazine -- or -- Bladex	1 1/2 to 4 lb. 1 1/2 to 4 lb. 1 1/2 to 4 lb.	80W-1 3/4 to 5 lb. 90DF-1 2/3 to 4 1/2 lb. 4L-1 1/2 to 4 qt. 80W-1 3/4 to 5 lb. 4L-1 1/2 to 4 qt. 90DF-1 2/3 to 4 1/2 lb. 80W-1 3/4 to 5 lb. 4L -1 1/2 to 4 qt.	15 or more	Controls most annual grass and broadleaf weeds. Apply anytime after planting to corn emergence. See **"Remarks"** of pre-plant incorporated for rate of application and precautions. Two or three-way combinations of these triazines may be used.
Dual -- or -- Lasso -- or -- Ramrod -- or -- Prowl	2 to 2 1/2 lb. 2 to 3 1/2 lb. 4 to 6 lb. 1 to 2 lb.	8E-1 to 1 1/4 qt. 2 to 3 1/2 qt. 4L-4 to 6 qt. 1 to 2 qt.	15 or more	Apply anytime after planting to corn emergence. These materials mainly control annual grasses. Some broadleaf weed control can be expected. Dual and Lasso will offer some control of nutsedge especially if 3/4 to 1 inch of rainfall occurs soon after application. For good control of both broadleaf and grass weeds these materials should be combined with one or more of the triazines; i.e., atrazine, Simazine and/or Bladex. Each of these grass control materials are labeled for various combinations. Check the individual labels for rates of application of the combinations.
		POST-EMERGENCE		
Atrazine plus Crop Oil or Surfactant	1 1/2 to 2 1/2 lb.	80W-2 to 3 lb. 90DF-1 2/3 to 2 3/4 lb. 4L-1 1/2 to 2 1/2 qt.	20 or more	When used post-emergence, atrazine should be applied before the grass weeds are more than 1 1/2 to 2 inches tall and before broadleaf weeds are more than 3 to 4 inches tall. Will give some control of **yellow nutsedge** which is 3 to 4 inches tall. Will not control fall panicum. See **"Remarks"** on atrazine above for precautions. Formulations of crop oils and surfactants vary widely so use according to individual labels. The oil-water ratio should not be narrower than a 1:10 ratio, especially on low-volume application.
Atrazine plus Banvel	1 1/2 to 2 1/2 lb. 1/4 lb.	80W-2 to 3 lb. 90DF-1 2/3 to 2 3/4 lb. 4L-1 1/2 to 2 1/2 qt. 1/2 pt.	20 or more	Better control of **Canada thistle** and other broadleaf weeds than atrazine plus oil. Not as good on grasses as the atrazine plus oil. **Do not mix atrazine, oil,** and **Banvel.** Use extra precaution to prevent drift.
Atrazine plus Lasso, atrazine plus Dual, Bicep (combination of atrazine and Dual), atrazine plus Bladex 80W (not Bladex 4L), Bladex 80W, and Lasso) may also be applied early post-emergence to 1-leaf stage of corn. Prowl plus atrazine and Prowl plus Bladex 80W (not Bladex 4L) may be applied to corn from emergence to the two-leaf stage of the corn. Weeds, especially grasses, must be small (1 to 2 inches) for effective control. Do not use crop oil with these treatments.				
2,4-D LV Ester -- or -- 2,4-D Amine	1/4 lb. 1/3 to 1/2 lb.	1/2 pt. 2/3 to 1 pt.	10 or more	Apply overall when weeds are up, but small. Controls only broadleaf. Damage always possible if cultivation or windstorms follow soon after application--hazard greater as corn gets larger and following a period of high temperatures (85°F and above). Use drop nozzles when corn is above 8 to 10 inches tall. Do not apply from time corn tassels to dough stage. Use precaution to prevent drift. Ester formulations more volatile than amines.

(continued)

Herbicide Recommendations for Corn *(continued)*

Herbicide	Active Ingredient per Acre	Formulated Product per Acre	Water Overall (gla/A)	Remarks
Banvel -- or -- 2,4-D Amine plus Banvel	1/4 lb. 1/4 lb. 1/8 lb.	1/2 pt. 1/2 pt. 1/4 pt.	10 or more	Apply after weeds are up. Small weeds are easier killed. Can be applied over the top of corn until 24 inches tall or until 15 days before tassel emergence whichever occurs first. Do not apply after that growth stage. Drops can be used with Banvel and may be desired for more effective spray placement and drift control. Mix with 2,4-D for broader spectrum weed control. Banvel K pre-mix available. **Caution: Soybeans are very sensitive to Banvel. To minimize spray drift potential onto soybeans and other sensitive crops follow label directions.**
Buctril/Brominal	1/4 to 1/2 lb.	1/2 to 1 1/2 pt. (See Remarks)	20 or more	**Buctril** and **Brominal** both contain the herbicide bromoxynil. The amount of active ingredient in Buctril is 2 lb/gal. and in Brominal is 4 lb/gal. Therefore the amount of product per acre will vary. Refer to the respective labels for specific rates. Apply when broadleaf weeds are small (See label). Can be applied over the top of corn up to the 8-leaf stage. Use flat fan nozzles and a minimum spray pressure of 30 psi. Do not add a spray additive or mix with liquid fertilizers. A second application may be made if a new flush of weeds occurs following the first application. The higher rate will suppress Canada thistle (foliage burn) when applied 8" to bud stage. May be applied aerially in 5 to 7 gallons of water per acre. Some leaf-burn of corn may occur but normally it will rapidly recover and no loss of yield will occur.
Buctril/Brominal plus Atrazine	1/4 to 1/2 lb. 1 to 1 1/4 lb.	1/2 to 1 1/2 pt. (See Remarks) 80W-1 1/4 to 1 1/2 lb. 90DF-1.1 to 1 3/8 lb. 4L-1 to 1 1/4 qt.	20 or more	Apply when broadleaf weeds are small (See label). Control of pigweeds up to the 6-leaf or 4 inches plus residual control of subsequent germinating weeds.
Buctril/Brominal plus 2,4-D	1/4 to 1/2 lb. 1/4 lb.	1/2 to 1 1/2 pt. (See Remarks) 1/2 pt (4 lb/gal)	20 or more	Apply when broadleaf weeds are small (See label). Control of wild mustards larger than 4-leaf or 4 inches. When corn exceeds 8 inches in height, drop nozzles must be used.
Basagran	3/4 to 1 lb.	3/4 to 1 qt.	20 or more	Will control most annual broadleaf weeds. Will offer partial control of Canada thistles and yellow nutsedge. Is more effective if applied to weeds when they are in the 2 to 6-leaf stage. On taller corn, use at least 40 psi pressure or drop nozzles to get better coverage of weeds. The addition of a surfactant or crop oil will improve control on difficult to kill species or on large weeds. Two 3/4-quart applications may give better control than one 1 1/2-quart application on hard to control weeds. Atrazine at 1 to 2 lb/A may be mixed with Basagran for added control of broadleaf and grassy weeds and to give residual control.
Evik (with surfactant)	2 lb	2 1/2 lb.	20 or more	Apply as a directed spray with drop nozzles. Will injure corn if spray is applied over the top. Corn should be over 8 to 10 inches tall and broadleaf and grass weeds no taller than 4 to 5 inches. Will control most annual broadleaf and grass weeds including 3 to 4 inch tall panicum. Increase spray volume if severe infestation of weeds.
Prowl -- or -- Treflan	1/2 to 1 1/2 lb. 3/8 to 1 lb.	1 to 3 pt. 3/4 to 2 pt.		**Cultivate-Spray system.** These herbicides can be used to prevent late germinating annual grasses in corn. Application can be made from 4 to 8 inch corn up to layby; however, **corn must be cultivated before application** so that soil is moved into the row around the corn plants. Incorporation of the herbicide by cultivation after application must be accomplished within 24 hours for Treflan and 7 days for Prowl.

RELATIVE EFFECTIVENESS OF CORN HERBICIDES ON WEEDS

	Crop Tolerance	Barnyardgrass	Crabgrass	Fall Panicum	Foxtails	Johnsongrass (Rhizome)	Johnsongrass (Seedling)	Quackgrass	Shattercane	Yellow Nutsedge	Annual Morningglory	Bindweed	Black Nightshade	Canada Thistle	Climbing Milkweed	Cocklebur	Common Ragweed	Giant Ragweed	Jerusalem Artichoke	Jimsonweed	Lambsquarter	Pigweed	Smartweed	Velvetleaf	Wild Cucumber
Preplant Incorporate																									
Eradicane [1]	G	E	E	E	E	F	G	F	G	G	P	P	P	P	P	P	F	P	P	P	F	G	P	P	P
Sutan +/Genate Plus	G	E	E	E	E	P	G	P	G	G	P	P	P	P	P	P	P	P	P	P	P	G	P	P	P
Atrazine	E	G	F	P	F	P	P	G	P	F	G	P	E	F	F	G	E	G	G	G	E	E	E	G	G
Bladex	G	G	G	F	F	P	P	F	P	P	G	P	G	P	P	G	E	G	F	F	E	F	E	F	F
Simazine	E	F	G	F	F	P	F	F	P	P	G	P	E	P	P	G	E	G	F	F	E	E	E	F	F
Eradicane + Atrazine	G	E	E	E	E	F	G	G	G	G	G	P	G	P	P	F	E	F	F	F	E	E	G	F	F
Sutan + Atrazine	G	E	E	E	E	P	G	F	G	G	G	P	G	P	P	F	G	F	F	F	E	E	G	F	F
Sutan + Bladex	G	E	E	E	E	P	G	F	G	G	G	P	G	P	P	F	G	F	F	F	E	F	G	F	P
Atrazine + Bladex	E	G	G	F	F	P	P	F	P	P	G	P	E	P	P	G	E	G	G	F	E	G	E	G	F
Lasso or Dual [2]	G	E	E	E	E	P	P	P	P	G	P	P	G	P	P	P	F	P	P	P	F	G	F	P	P
Atrazine + Lasso or Dual	G	E	E	E	E	P	P	F	P	G	G	P	E	P	P	F	G	F	F	F	E	E	E	F	F
Preemergence																									
Atrazine	E	G	F	P	G	P	P	F	P	F	G	P	E	P	P	G	E	G	P	G	E	E	E	G	P
Bladex	G	G	G	F	G	P	P	P	P	P	G	P	G	P	P	G	E	F	P	G	E	F	E	F	P
Simazine	E	G	G	F	G	P	P	P	F	F	G	P	E	P	P	G	E	F	P	F	E	E	G	F	P
Atrazine + Bladex	E	G	F	F	G	P	P	P	P	F	G	P	E	P	P	G	E	G	P	F	E	E	E	G	P
Atrazine + Simazine	E	G	F	F	G	P	P	P	P	F	G	P	E	P	P	G	E	G	P	F	E	E	E	G	P
Lasso or Dual	G	E	E	E	E	P	P	P	P	F	P	P	G	P	P	P	P	P	P	P	G	G	F	P	P
Atrazine + Lasso or Dual	G	G	G	G	E	P	P	P	P	F	F	P	E	P	P	F	G	F	P	F	E	E	G	G	P
Bladex + Lasso or Dual	G	G	G	E	E	P	P	P	P	F	F	P	E	P	P	F	G	F	P	F	E	E	G	F	P
Prowl	F	E	E	E	E	P	F	P	F	P	P	P	P	P	P	P	P	P	P	F	G	G	F	F	P
Atrazine + Prowl	G	G	G	G	E	P	P	P	P	F	F	P	G	P	P	F	G	F	P	F	E	E	G	G	P
Bladex + Prowl	G	G	G	G	E	P	P	P	P	P	F	P	F	P	P	F	G	F	P	F	E	G	G	F	P
Ramrod	G	G	E	E	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	F	G	P	P	P
Atrazine + Ramrod	E	G	G	G	E	P	P	P	P	F	F	P	F	P	P	F	G	F	P	F	E	E	G	G	P
Postemergence																									
Atrazine + oil	G	G	F	P	G	P	P	G	P	F	E	F	G	G	F	G	E	G	F	G	E	E	G	G	G
Bladex-80W	F	G	F	G	G	P	F	P	P	P	G	P	G	P	P	G	G	F	P	G	E	F	E	F	P
2,4-D	F	P	P	P	P	P	P	P	P	P	E	F	G	F	F	E	G	G	G	F	G	G	F	G	P
Banvel	F	P	P	P	P	P	P	P	P	P	E	G	G	G	F	E	G	G	G	G	G	G	E	G	P
Basagran	G	P	P	P	P	P	P	P	P	G	P	F	P	G	F	E	G	G	P	G	F	F	G	G	P
Evik	F	G	E	E	E	P	F	P	F	F	G	F	G	F	F	G	G	G	F	G	G	G	G	G	F
Brominal/Buctril	G	P	P	P	P	P	P	P	P	P	G	F	E	F	F	E	G	G	P	G	G	F	E	E	E

[1] Rating code: E = Excellent, G = Good, F - Fair, P = Poor .

[2] Lasso or Dual should not be incorporated deeper than 2 inches.

SOYBEANS

Fertilizer Recommendations

Soil pH. Generally, soybeans produce the largest yields when the soil pH is between 6.2 and 7.0.

Nitrogen. The soybean is a legume and can fix adequate atmospheric nitrogen to produce a yield of at least 70-80 bushels per acre.

Examples of Phosphorus (expressed as lb P_2O_5/A) **Recommended for Soybeans**

Soil Test Value	Yield Goals (Bu/A)		
	40	60	80
lb P/A	Annual Recommendation		
10	55	70	85
20	45	60	75
30-60	<u>35</u>	<u>50</u>	<u>65</u>
70	25	40	55
80	20	30	45
90	0	20	35
100	0	0	25

Underlined numbers are the approximate amounts of crop removal.

Examples of Potassium (expressed as lb K_2O/A) **Recommended for Soybeans**

Soil Test Value	Yield Goals (Bu/A)								
	40			60			80		
	C.E.C.			C.E.C.			C.E.C.		
	10	20	30	10	20	30	10	20	30
lb K/A	Annual Recommendation								
50	110	120	130	140	150	160	190	200	210
150	90	100	110	120	130	140	170	180	190
250	70	80	90	100	110	120	150	160	170
350	<u>55</u>	60	70	<u>85</u>	90	100	130	140	150
450	50	<u>55</u>	<u>55</u>	80	<u>85</u>	<u>85</u>	<u>110</u>	<u>115</u>	<u>115</u>
550	30	40	50	60	70	80	90	100	110

Underlined numbers are the approximate amounts of crop removal.

Weed Control

With the earlier development of pre-emergence herbicides and the more recent development of the post-emergence materials for soybeans, there has been a tendency to control weeds without cultivation.

Several soybean herbicides may cause injury to soybeans, especially when herbicide rates are increased to improve control of problem weeds. Fortunately, soybeans usually outgrow modest amounts of early injury with little or no effect on yield. Under unusual environmental conditions, severe injury has been obtained with Lorox/Linex and Sencor/Lexone. Sencor/Lexone injury to soybeans can be compounded by any atrazine or simazine carryover problem from the previous year. To reduce or eliminate this problem, use no more than 1.6 pounds active per acre (2 lb. 80W) of atrazine or simazine the year before planting soybeans.

Source: *Ohio Agronomy Guide*, pp. 48-49

RELATIVE EFFECTIVENESS OF SOYBEAN HERBICIDES ON MAJOR WEEDS

EFFECTIVENESS

E = Excellent

G = Good

F = Fair

P = Poor

- = Not Applicable

		GRASSES												BROADLEAVES													
	Tolerance	Barnyardgrass	Crabgrass	Fall Panicum	Forage Grasses	Foxtails	Johnsongrass (Rhizome)	Johnsongrass (Seedling)	Quackgrass	Shattercane	Volunteer Corn	Volunteer Wheat	Yellow Nutsedge	Annual Morningglory	Black Nightshade	Burcucumber	Bindweeds	Canada Thistle	Cocklebur	Common Ragweed	Giant Ragweed	Jimsonweed	Lambsquarter	Perennial Vines	Pigweed	Smartweed	Velvetleaf	Volunteer Sunflower
PREPLOW																											
Dowpon M	P	P	P	P	G	P	G	P	G	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Roundup	P	P	P	P	G	P	G	P	G	P	P	P	F	P	P	P	G	G	P	P	P	P	P	G	P	P	P	P
PREPLANT INCORPORATE																											
Prowl, Treflan	G	E	E	E	P	E	F	G	P	G	P	-	P	P	P	P	P	P	P	P	P	P	F	P	G	P	P	P
Sencor/Lexone + DNA[1]	F	E	E	E	P	E	F	G	P	G	P	-	P	P	P	P	P	P	F	G	F	G	E	P	E	E	G	E
Lasso, Dual	G	E	E	E	P	E	P	F	P	F	P	-	G	P	G	P	P	P	P	P	P	P	P	P	E	E	G	E
Sencor/Lexone + Lasso, Dual	F	E	E	E	P	E	P	F	P	F	P	-	G	P	G	P	P	P	F	G	F	G	E	P	E	E	G	E
Vernam/Reward	F	E	E	E	P	E	P	G	P	G	P	-	G	P	P	P	P	P	P	P	P	P	F	P	G	P	F	P
Vernam/Reward + DNA	G	E	E	E	P	E	F	G	P	G	P	-	G	P	P	P	P	P	P	P	P	P	F	P	G	P	F	P
DNA & Basagran	G	E	E	E	P	E	F	G	P	G	P	-	G	P	P	P	P	F	E	G	G	G	G	P	G	G	G	G
DNA & Blazer	F	E	E	E	P	E	F	G	P	G	P	-	P	G	G	P	F	F	G	E	G	G	F	F	E	G	P	G
DNA & Dyanap	F	E	E	E	P	E	F	G	P	G	P	-	P	G	G	P	F	F	G	G	G	G	F	P	G	G	P	G
PREEMERGENCE																											
Amiben	G	G	G	G	P	G	P	P	P	P	P	P	P	P	F	P	P	P	P	G	P	P	G	P	G	G	F	P
Lasso, Dual	G	E	E	E	P	E	P	P	P	P	P	P	F	P	G	P	P	P	P	P	P	P	P	P	G	P	P	P
Amiben + Lasso, Dual	G	E	E	E	P	E	P	P	P	P	P	P	F	P	E	P	P	P	P	G	P	P	G	P	E	G	F	P
Sencor/Lexone	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	F	G	F	G	E	P	E	E	G	G
Sencor/Lexone + Lasso, Dual	F	E	E	E	P	E	P	P	P	P	P	P	F	P	G	P	P	P	F	G	F	G	E	P	E	E	G	G
Lorox/Linex	F	P	P	P	P	P	P	P	P	P	P	P	P	P	F	P	P	P	P	G	P	P	E	P	E	E	F	F
Lorox/Linex + Lasso, Dual	F	E	E	E	P	E	P	P	P	P	P	P	F	P	E	P	P	P	P	G	P	P	E	P	E	E	F	F
Surflan, Prowl	F	E	E	E	P	E	P	F	P	P	P	F	P	P	P	P	P	P	P	P	P	P	F	P	G	P	P	P
Sencor/Lexone + Surflan, Prowl	F	E	E	E	P	E	P	F	P	P	P	F	P	P	P	P	P	P	F	G	F	G	E	P	E	E	G	G
Lorox/Linex + Surflan, Prowl	F	E	E	E	P	E	P	F	P	P	P	F	P	P	F	P	P	P	P	G	P	P	E	P	E	E	G	F
Modown	F	P	P	P	P	P	P	P	P	P	P	P	P	F	F	P	P	P	P	P	G	E	P	E	G	G	P
Amiben + Sencor/Lexone + Lasso, Dual	G	E	E	E	P	E	P	P	P	P	P	P	F	P	E	P	P	P	F	G	F	G	E	P	E	E	G	F
AT CRACKING																											
Dyanap	G	P	P	P	P	P	P	P	P	P	P	P	P	G	F	P	P	P	G	G	G	G	G	P	G	G	F	F
Dyanap + Lasso, Dual	G	G	G	G	P	G	P	P	P	P	P	P	F	G	G	P	P	P	G	G	G	G	G	P	G	G	F	F
POSTEMERGENCE																											
Alanap + 2,4-DB	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	G	G	G	G	G	P	F	P	P	E
Amiben	G	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	F	G	P
Basagran	G	P	P	P	P	P	P	P	P	P	P	P	G	P	P	F	F	G	E	G	G	G	G	P	P	G	G	G
Basagran + 2,4-DB	F	P	P	P	P	P	P	P	P	P	P	P	G	G	P	F	F	G	E	G	G	G	G	P	P	G	G	G
Blazer	F	P	F	F	P	G	P	F	P	P	P	P	P	E	E	F	G	F	G	E	G	G	F	G	E	G	F	F
Blazer + 2,4-DB	F	P	F	F	P	G	P	F	P	P	P	P	P	E	E	F	G	F	E	E	G	G	F	G	E	G	F	F
Dyanap	F	P	P	P	P	P	P	P	P	P	P	P	P	G	G	P	F	F	G	G	G	G	G	P	P	F	P	F
Fusilade	E	E	E	E	G	E	E	E	G	E	E	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Hoelon	E	E	E	E	P	E	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Poast	E	E	E	E	G	E	E	E	F	E	E	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Roundup: RCS, WA[2]	G	-	-	-	-	-	G	G	-	G	E	-	-	-	-	P	P	G	G	G	G	G	G	-	G	-	G	E
DIRECTED POSTEMERGENCE																											
Lorox/Linex	F	G	G	G	P	G	P	F	P	F	P	?	F	F	G	G	F	F	G	G	G	G	G	F	G	G	G	?
Lorox/Linex + 2,4-DB	F	G	G	G	P	G	P	F	P	F	P	?	F	E	G	G	F	F	E	G	G	G	G	F	G	G	G	?
Sencor	F	G	G	G	P	G	P	F	P	F	P	?	F	F	P	E	F	F	E	G	G	G	G	F	G	G	G	?
Sencor + 2,4-DB	F	G	G	G	P	G	P	F	P	F	P	?	F	E	P	E	F	F	E	G	G	G	G	F	G	G	G	?

[1]DNA = Dinitroaniline Herbicide = Basalin, Prowl, or Treflan

[2]RCS = Recirculating sprayer, WA = Wick applicator .

\+ = Tank-Mix

& = Sequential Application

Source: *Ohio Agronomy Guide*, pp. 49-50

HERBICIDE RECOMMENDATIONS FOR SOYBEANS

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
		—— PREPLANT or PRETILLAGE ——		
Dowpon M plus Surfactant	3 3/4 to 5 ¼	5 to 7 lb	20 or more	Controls established johnsongrass. Apply to 8 to 12 inch tall johnsongrass, and plow 3 days later. Disk and plant 5 days after plowing. If soil remains unusually dry after plowing, a longer wait may be needed before planting. Treflan or Prowl incorporated before planting will be needed to control johnsongrass from seed. Roundup in a wick-applicator may be needed to control escaped rhizome johnsongrass. See recommendations for use of these herbicides.
Roundup plus Surfactant	0.75 lb.	1 qt 2 qts/100 gal spray solution	5-10	For control of **quackgrass,** apply Roundup plus surfactant in late September, October or November while high temperatures reach at least the mid 40's daily and the quackgrass has at least 75% green color. In the fall wait 10 days before tillage. In the spring, delay application until quackgrass reaches 8 to 12 inches in height and 3 to 4 leaves. Wait 3 or more days after application before tillage. For control of **johnsongrass,** apply Roundup plus surfactant following fallow, wheat harvest or silage corn harvest or preplant to soybeans when most plants have reached the boot to head stage of growth, 18 to 20 inches in height. Wait 7 days before tillage. Undisturbed johnsongrass is 18 to 20 inches tall about June 10 to 12 along the Ohio River, June 14 to 16 from Chillicothe to Columbus and June 18 to 20 north of Columbus. Treflan or Prowl incorporated before planting will be needed to control johnsongrass from seed. Roundup in a wick-applicator or one of the post-emergence grass control herbicides may be needed to control escaped rhizome johnsongrass. To control **wirestem muhly,** apply Roundup plus surfactant when actively growing and plants are 8 inches or more in height. Allow 3 days or more before tillage. Later germinating seedlings must be controlled with residual herbicides to maintain rhizome control.
Roundup	1.5 lb	2 qts	5-10	For control of **Canada thistle,** apply Roundup in late September through October, but prior to yellowing of foliage due to frost. After harvest, mowing or tillage in the late summer or fall, allow 4 weeks for initiation of active growth prior to application. In the fall, treat rosettes through flowering stages when thistles are actively growing. Allow 10 days before tillage. In the spring or early summer, apply to actively growing thistles when most are at or near the bud stage of growth. Wait 3 or more days before tillage.
		—— PREPLANT INCORPORATED ——		
A **disk** or **field cultivator** typically incorporates herbicides half the depth they are set to cut into the soil. The following treatments should be incorporated 2 to 3 inches deep. Therefore, a disk or field cultivator should be set to cut 5 to 6 inches deep into the soil. Two passes with a disk or field cultivator at 5 to 7 mph are typically needed for best results. The second pass should be a little shallower than the first. **Power driven equipment** incorporate herbicides to the depth they cut into the soil. Therefore, they should be set to cut 2 to 3 inches deep into the soil and run at 4 to 5 mph. One pass is usually adequate with power driven equipment.				
Prowl	3/4 to 1½	1½ to 3 pt	15 or more	Controls annual grasses, johnsongrass seedlings, lambsquarter and pigweed. Usually provides some velvetleaf suppression. Incorporate 2 to 3 inches deep within 7 days after application. Incorporation is not necessary if at least 1/4 inch of rainfall occurs within 7 days after application. May be applied on dry bulk fertilizer. See herbicide label for use rate on appropriate soils. To improve broadleaf weed control, Sencor/Lexone (1/4 to 1/2 lb active/A), Lorox/Linex (1/2 to 1 lb active/A), or Amiben (1.8 to 2.7 lb active/A) may be applied as a preemergence overlay.
Treflan	½ to 1¼	1 to 2½ pt	15 or more	Controls annual grasses, johnsongrass seedlings, lambsquarter and pigweed. Incorporate 2 to 3 inches deep within 24 hours of application. May be applied on dry bulk fertilizer. See herbicide label for use rates on appropriate soils. To improve broadleaf weed control, Sencor/Lexone (1/4 to 1/2 lb active/A), Lorox/Linex (1/2 to 1 lb active/A), or Amiben (1.8 to 2.7 lb active/A) may be applied as a preemergence overlay.

Source: *Ohio Agronomy Guide*, pp. 51-58

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
		PREPLANT INCORPORATED - (continued)		
Vernam Reward	2 to 3 2 to 2½	2 1/3 to 3½ pt 2 2/3 to 3 1/3 pt	15 or more	Vernam contains 7 lb/gal vernolate while Reward contains 6 lb/gal vernolate plus an extender. Controls annual grasses, yellow nutsedge, johnsongrass seedlings, and some broadleaf weeds. Provides some suppression of annual morningglory and velvetleaf. Incorporate 2 to 3 inches deep immediately after application. Some stunting and/or leaf deformity may occur. May be applied on dry bulk fertilizer. See herbicide label for use rate on appropriate soils. To improve broadleaf weed control, Lorox/Linex (1/2 to 1 lb active/A) or Amiben (1.8 to 2.7 lb active/A) may be applied as a preemergence overlay. Do not use Sencor/Lexone with Vernam at the full rates of application as severe injury may occur.
Vernam/Reward plus Prowl or Treflan	2 to 3½ 3/4	2 1/3 to 3½ pt 1½ pt	15 or more	For use mainly where seedling johnsongrass and yellow nutsedge are a problem in the same field; or where stronger activity on seedling johnsongrass or shattercane is desired. Also controls annual grasses and several broadleaf weeds. Incorporate 2 to 3 inches deep immediatelv after application. The chance of Vernam/ Reward injury is reduced with the tank-mix. May be applied on dry bulk fertilizer. To improve broadleaf weed control, Lorox/Linex (½ to 1 lb active/A) or Amiben (1.8 to 2.7 lb active/A) may be applied as a preemergence overlay. Vernam/Reward: Treflan is now labelled to be **tank-mixed** with **Sencor/Lexone** to improve broadleaf weed control. Use 1/4 lb active/A Sencor/Lexone on medium textured soils, 3/8 lb active/A Sencor/Lexone on fine, heavy textured soil, and **do not** use this tank-mix on light soils. Vernam and Reward are also cleared for tank-mixing with Amiben and Lasso for preplant incorporation. Check the label for specific rates of application.
Sencor/Lexone plus Prowl or Treflan	¼ to ½ See rates and remarks for each of these dinitroaniline herbicides.	4L: ½ to 1 pt DF: 1/3 to 2/3 lb	15 or more	Controls most annual broadleaves and grasses, including johnsongrass seedlings. Will reduce infestation of jimsonweed, cocklebur, and giant ragweed. Will not control annual morningglory or eastern black nightshade. Do not plant soybeans more than 2 inches deep. Reduce Sencor/Lexone rate if soil pH is 7.5 or above, or if any atrazine carryover. Incorporate 2 to 3 inches deep. See the herbicide labels for use rates on appropriate soils.
Sencor/Lexone plus Prowl or Treflan Followed by a preemergence overlay of Sencor/Lexone	¼ to ½ See rates and remarks for each of these dinitroaniline herbicides. 1/8 to 1/2	4L: ½ to 1 pt DF: 1/3 to 2/3 lb 4L: ½ to 1 pt DF: 1/6 to 2/3 lb	15 or more	This sequential application (preplant incorporated followed by preemergence) is designed to help control some problem broadleaf weeds such as: cocklebur, velvetleaf, jimsonweed, and common ragweed. Eastern black nightshade and annual morningglory are not controlled. Giant ragweed will be suppressed. Incorporate the tank-mix 2 to 3 inches deep. Apply the preemergence overlay of Sencor/Lexone after soybeans are planted, but before they are up. Do not use on soils with a pH of 7.5 or above, light soils with less than 1% organic matter, or if any atrazine carryover. Do not plant soybeans more than 2 inches deep. See the herbicide labels for use rates on appropriate soils.
		—— SHALLOW PREPLANT INCORPORATED ——		
The following treatments should be incorporated 1 to 2 inches deep into the soil. Deeper incorporation will result in poor weed control. With proper equipment and adequate soil preparation, this shallow incorporation can usually be done with one pass. A disk usually will not provide adequate incorporation. **Field cultivators** with leveling devices such as spike-tooth harrows (with 3 to 5 rows of teeth) or rolling baskets, **cultimulchers,** and **power driven equipment** will provide adequate one-pass, shallow incorporation. Field cultivators and cultimulchers should be set to cut 3 to 4 inches into the soil and operated at 5 to 7 mph. Power driven equipment should be set to cut 2 inches into the soil and operated at 4 to 5 mph.				
Lasso - or - Dual - or - Prowl	2½ to 4 2 to 3 3/4 to 1½	5 to 8 pt 2 to 3 pt 1½ to 3 pt	15 or more	Controls most annual grasses and pigweed. Use the higher rates of Lasso or Dual to control yellow nutsedge and eastern black nightshade. Prowl will control seedling johnsongrass and lambsquarter, but will not control nutsedge or nightshade. See the herbicide labels for use rates on appropriate soils and weeds. May be applied on dry bulk fertilizer. Incorporate only 1 to 2 inches deep. To improve broadleaf weed control, Sencor/Lexone (1/4 to 1/2 lb active/A), or Lorox/Linex (½ to 1 lb active/A), or Amiben (1.8 to 2.7 lb active/A) may be applied as a preemergence overlay.

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
SHALLOW PREPLANT INCORPORATED - (continued)				
Sencor/Lexone plus Lasso or Dual or Prowl	¼ to ½ 2½ to 3 2 to 2½ 3/4 to 1¼	4L: ½ to 1 pt DF: 1/3 to 2/3 lb 5 to 6 pt 2 to 2½ pt 1½ to 2½ pt	15 or more	Controls most annual broadleaves and grasses. Will reduce infestation of jimsonweed, cocklebur, and giant ragweed. Will not control annual morningglory. Use the higher rates of Lasso or Dual to control yellow nutsedge or eastern black nightshade. Use Prowl to control seedling johnsongrass. Reduce Sencor/Lexone rate if soil pH is 7.5 or above, or if any atrazine carryover. See the herbicide labels for use rates on appropriate soils and weeds. Do not plant soybeans more than 2 inches deep. May be applied on dry bulk fertilizer. Incorporate only 1 to 2 inches deep.
Sencor/Lexone plus Lasso or Dual or Prowl Followed by a preemergence overlay of Sencor/Lexone	¼ to ½ 2½ to 3 2 to 2½ 3/4 to 1¼ 1/8 to 1/2	4L: ½ to 1 pt DF: 1/3 to 2/3 lb 5 to 6 pt 2 to 2½ pt 1½ to 2½ pt 4L: ¼ to 1 pt DF: 1/6 to 2/3 lb	15 or more	This sequential application (preplant incorporated followed by preemergence) is designed to help control some problem weeds such as: cocklebur, velvetleaf, jimsonweed, and common ragweed. Annual morningglory will not be controlled. Giant ragweed will be suppressed. Use the higher rates of Lasso or Dual to control yellow nutsedge or eastern black nightshade. Use Prowl to control seedling johnsongrass. Incorporate the tank-mix only 1 to 2 inches deep. Apply the preemergence overlay of Sencor/Lexone after soybeans are planted, but before they are up. Do not use on soils with a pH of 7.5 or above, light soils with less than 1% organic matter, or if any atrazine carryover. Do not plant soybeans more than 2 inches deep. See the herbicide labels for use rates on appropriate soils and weeds.
Amiben plus Lasso or Dual or Prowl	1.8 to 2.7 2½ to 3 2 to 2½ 3/4 to 1¼	2L: 8 to 12 pt DS: 2.4 to 3.6 lb 5 to 6 pt 2 to 2½ pt 1½ to 2½ pt	15 or more	Controls most annual grasses and several broadleaves. Use Lasso or Dual with Amiben to control eastern black nightshade and yellow nutsedge. Use the high rates of Lasso or Dual to control nutsedge. Use Prowl with Amiben to control seedling johnsongrass. Cocklebur, jimsonweed, giant ragweed, and annual morningglory usually are not controlled. Excessive rainfall may cause Amiben to leach readily in light soils and reduce its efficacy. See the herbicide labels for use rates on appropriate soils and weeds. Incorporate only 1 to 2 inches deep.
Sencor/Lexone plus Lasso or Dual plus Amiben	¼ to 3/8 2 to 3 2 to 2½ 1.8	4L: ½ to 3/4 pt DF: 1/3 to 1/2 lb 4 to 6 pt 2 to 2½ pt 2L: 8 pt DS: 2.4 lb	15 or more	Controls most annual grasses and broadleaves, including eastern black nightshade. Will reduce infestation of jimsonweed, cocklebur, and giant ragweed. Will not control annual morningglory. Use the higher rates of Lasso or Dual to control yellow nutsedge. Use 3/8 lb active/A of Sencor/Lexone on heavy soils, and ¼ lb active/A of Sencor/Lexone on light soils. This three-way comination provides greater crop safety, better herbicide suitability on variable soil types, and more consistent and broader spectrum weed control than the use of just any two of these herbicides. Incorporate only 1 to 2 inches deep.
PREEMERGENCE				
Herbicides sprayed on the soil surface are dependent on rainfall to move them into the soil where they can control weeds. One-quarter to one-half inch of rain within seven days of herbicide application is enough to move most herbicides into the soil. If rainfall does not occur within seven days, the field should be rotary hoed or cultivated to physically move the herbicides into the soil and remove any weeds that may be present.				
Amiben	2¼ to 2.7	2L: 10 to 12 pt DS: 3 to 3.6 lb	15 or more	Controls many annual broadleaves and grasses. Fair control of eastern black nightshade and velvetleaf. Cocklebur, jimsonweed, giant ragweed, and annual morningglory usually are not controlled. To improve control of several broadleaf weeds, Amiben (1.8 lb active/A) can be tank-mixed with **Lorox/Linex** (¼ to 1 lb active/A) or **Sencor/Lexone** (¼ to ½ lb active/A). See herbicide labels for use rates on appropriate soils. Amiben 10G granules are available. Amiben may be applied up to the second trifoliate leaf stage of soybeans. However, any weeds present at the time of application should be removed with a rotary hoe or shallow cultivation.
Amiben plus Lasso or Dual or Prowl	1.8 to 2.7 2 to 3 2 to 2½ 3/4 to 1¼	2L: 8 to 12 pt DS: 2.4 to 3.6 lb 4 to 6 pt 2 to 2½ pt 1½ to 2½ pt		Controls most annual grasses and several broadleaves. Use Lasso or Dual with Amiben to control eastern black nightshade. Fair control of velvetleaf. Cocklebur, jimsonweed, giant ragweed, and annual morningglory usually are not controlled. With adequate rainfall, fair to good control of yellow nutsedge with Lasso or Dual and seedling johnsongrass with Prowl may be provided. See herbicide labels for use rates on appropriate soils.

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
		POSTEMERGENCE - (continued)		
Sencor/Lexone	¼ to 5/8	4L: ½ to 1¼ pt DF: 1/3 to 5/6 lb	15 or more	Controls most annual broadleaves and grasses. Will reduce infestation of jimsonweed, cocklebur, and giant ragweed. Will not control annual morningglory. Use the higher rates of Lasso or Dual to control eastern black nightshade. With adequate rainfall, fair to good control of yellow nutsedge with Lasso or Dual and seedling johnsongrass with Prowl may be provided. Sencor/Lexone will cause occasional soybean injury after emergence. Plant soybeans at least 1½ inches deep to reduce injury hazard. Reduce Sencor/Lexone rate if soil pH is 7.5 or above, or if any atrazine carryover. See herbicide labels for use rates on appropriate soils.
plus				
Lasso or	2 to 3	4 to 6 pt		
Dual or	2 to 2½	2 to 2½ pt		
Prowl	3/4 to 1¼	1½ to 2½ pt		
Sencor/Lexone	¼ to 3/8	4L: ½ to 3/4 pt DF: 1/3 to 2/3 lb	15 or more	Controls most annual grasses and broadleaves, including eastern black nightshade. Will reduce infestation of jimsonweed, cocklebur, and giant ragweed. Will not control annual morningglory. With adequate rainfall, fair to good yellow nutsedge control may be provided. Use 3/8 lb active/A of Sencor/Lexone on heavy soils, and ¼ lb active/A Sencor/Lexone on light soils. This three-way combination provides greater crop safety, better herbicide suitability on variable soil types, and more consistent and broader spectrum weed control than the use of just any two of these herbicides.
plus				
Lasso or	2 to 3	4 to 6 pt		
Dual	2 to 2½	2 to 2½ pt		
plus				
Amiben	1.8	2L: 8 pt DS: 2.4 lb		
Lorox/Linex	½ to 1	50W: 1 to 2 lb 4L: 1 to 2 pt	15 or more	Controls most annual broadleaves and grasses. Fair velvetleaf control. Jimsonweed, cocklebur, giant ragweed, and annual morningglory usually are not controlled. Use Lasso or Dual with Lorox/Linex to control eastern black nightshade. With adequate rainfall, fair to good control of yellow nutsedge with Lasso or Dual and seedling johnsongrass with Prowl may be provided. Lorox/Linex will cause occasional soybean injury after emergence. Plant soybeans at least 1½ inches deep to reduce injury hazard. See herbicide labels for use rates on appropriate soils.
plus				
Lasso or	2 to 3	4 to 6 pt		
Dual or	2 to 2½	2 to 2½ pt		
Prowl	3/4 to 1¼	1½ to 2½ pt		
Delayed Preemergence				Apply when the first soybean plants begin to break through the soil to before the true leaves open. Do not apply beyond this stage as severe injury may occur. Controls most annual grasses and broadleaves, including eastern black nightshade. Fair to good control of jimsonweed, cocklebur, giant ragweed, and annual morningglory. Velvetleaf usually is not controlled. See herbicide labels for use rates on appropriate soils.
Dyanap	4½	12 pt	15 or more	
plus				
Lasso or	2 to 3	4 to 6 pt		
Dual	2 to 2½	2 to 2½ pt		

—— POSTEMERGENCE ——

To obtain the best results with postemergence herbicides, the applications have to be made timely (proper size weeds) and when weeds are actively growing. In most situations, small weeds (less than 4 inches tall) are most easily controlled. Walk your fields weekly at least until the soybean canopy closes so weed problems that may develop can be controlled with timely postemergence applications. If weeds are under drought-stress, efficacy of all postemergence herbicides will be reduced. Under these conditions, wait until there has been adequate rainfall for weeds to be actively growing before making herbicide applications.

Basagran	3/4 to 1	1½ to 2 pt	20 to 40	Controls several annual broadleaves, including cocklebur, giant ragweed, jimsonweed, and velvetleaf. Also provides good control of Canada thistle and yellow nutsedge. Poor control of annual morningglory, eastern black nightshade, and pigweed. Most effective when applied to annual broadleaves that are 2 to 6 inches tall (21 to 28 days after planting). See herbicide label for use rate and maximum weed height. For hard to control weeds, such as Canada thistle or yellow nutsedge, a split application (3/4 plus 3/4 lb active/A) provides better control than a single application. Apply when thistles or nutsedge are 6 to 8 inches tall and a second application 7 to 10 days later. Use 40 to 60 psi.
plus				
Oil Concentrate	2 pt	2 pt		
Basagran	1	2 pt	20 to 40	Controls annual morningglory in addition to weeds listed on Basagran label. Will also provide more consistant control of maximum size weeds on Basagran label. Apply before morningglory vines are 10 inches long.
plus				
Butoxone or	.03	2 oz		
Butyrac 200	.03	2 oz		

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
				POSTEMERGENCE - (continued)
Blazer plus Surfactant	½	2 pt	20 to 40	Controls several annual broadleaves, including giant ragweed, jimsonweed, annual morningglory, eastern black nightshade, and pigweed. May be weak on cocklebur. Poor control of velvetleaf, lambsquarter, and yellow nutsedge. Most effective when applied to annual broadleaves that are 2 to 6 inches tall (21 to 28 days after planting). Will also burn back bindweeds, other perennial vines, and Canada thistle and retard their growth. Apply when vines are 12 to 18 inches long or thistles are 6 to 8 inches tall. Underground roots will not be killed. Provides good control of escaped annual grasses, such as foxtails, fall panicum, and seedling johnsongrass. For best results, add a non-ionic surfactant and apply when grasses are 2 to 3 inches tall. See herbicide label for amount of surfactant to add to Blazer. Temporary leaf burn will occur after application. Soybeans rapidly outgrow this injury. Use 40 to 60 psi. The liquid fertilizers **10-34-0** and **28-0-0** may be used as adjuvants with Blazer and Blazer combinations under special situations. See the Blazer label for the latest use directions of these fertilizer solutions.
Blazer plus Butoxone or Butyrac 200	½ .03 .03	2 pt 2 oz 2 oz	20 to 40	Better control, than Blazer alone, of cocklebur, annual morningglory, common ragweed, jimsonweed, and pigweed when weed size exceeds that specified on the Blazer label. Apply before morningglory vines are 12 inches long, or other susceptible weeds are no more than 12 inches tall. **Do not** use surfactant or crop oil with this mixture. Soybeans should have at least 5 fully expanded trifoliate leaves when this application is made.
Basagran plus Blazer —or— Blazer plus Basagran	3/4 ¼ 3/8 ½	1½ pt 1 pt 1½ pt 1 pt	20 to 40 20 to 40	For use when Basagran alone or Blazer alone will not control all weeds that are present. If majority of the weeds in the field are susceptible to Basagran, and in particular velvetleaf and yellow nutsedge, use 3/4 lb active/A Basagran plus ¼ lb active Blazer. For best velvetleaf or nutsedge control add 1 to 2 pt/A of oil concentrate to the tank-mix. If the majority of weeds in the field are susceptible to Blazer, and in particular annual morningglory, pigweed, eastern black nightshade and escaped annual grasses, use 3/8 lb active/A of Blazer and ½ lb active/A Basagran. For best control of escaped annual grasses, add 1 pt/A of oil concentrate or surfactant to the tank-mix. The use of oil concentrate or surfactant in these tank-mixes usually enhances foliar leaf burn. Soybeans rapidly outgrow this injury. Use 40 to 60 psi.
Dyanap	1½ to 3 lb	4 to 8 pt	8 to 10	Apply **after** soybeans have at least 2 trifoliate leaves. Will control several annual broadleaf weeds including jimsonweed, cocklebur, giant ragweed, annual morningglory, and small eastern black nightshade. Will provide fair control of bindweeds and Canada thistle. Use 4 pt/A of Dyanap if weeds are 1 to 3 inches tall and 8 pt/A if weeds are 3 to 6 inches tall. Nightshade should be less than 3 inches tall for best results. Velvetleaf usually is not controlled. Temporary leaf burn will occur after application. Soybeans will outgrow this injury in 1 to 2 weeks. To keep injury to a minimum, use only 8 to 10 gallons of water per acre, 40 to 60 psi, and position spray boom 18 to 36 inches above the top of the weed or soybean canopy. The spray should be a fine mist of fog for maximum weed control and minimum crop injury. Do not apply when soybeans are wet as severe injury will occur. Do not use a surfactant or oil with Dyanap. For hard to control weeds, such as jimsonweed, cocklebur, giant ragweed, and morningglory, a split application (1½ plus 1½ lb active/A) may be applied. Apply the second application if regrowth or new growth occurs--usually 10 to 14 days after the first application.
Dyanap plus Butoxone or Butyrac 200	1½ to 3 .03 .03	4 to 8 pt 2 oz 2 oz	8 to 10	Provides more consistent control of weeds on Dyanap label than Dyanap alone. Observe application precautions for Dyanap; otherwise severe injury to soybeans may occur.

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
		POSTEMERGENCE - (continued)		
Amiben plus Butoxone Butyrac 200	2½ to 3 .03	4L: 10 to 12 pts 75DS: 3.0 to 3.6 lbs 2 oz	10 to 20	When applied postemergence as a tank mixture, Amiben and Butyrac 200/Butoxone will control or suppress pigweed, velvetleaf, cocklebur and smartweed. Also several other broadleaf species such as giant ragweed and jimsonweed will be affected. This mixture will have no effect on the grasses. Apply when soybeans have 2 to 4 trifoliate leaves but before the weeds are more than 4 inches tall. Some temporary twisting, curling or malformation of soybean leaves and stems will occur. Under heavy weed pressure or on larger weeds add 1 pint/A of a crop oil concentrate. This may cause more soybean injury.
Hoelon plus Oil Concentrate	1 2 pt	2 2/3 pt 2 pt	20 to 40	Controls most annual grasses and volunteer corn. Will not control seedling johnsongrass or shattercane. Apply to annual grasses less than 4 inches tall, and to volunteer corn less than 12 inches tall. **Do not** tank-mix Hoelon with Basagran, Blazer, or Dyanap as decreased grass control will occur. Delay 7 days between Basagran, Blazer, or Dyanap use and Hoelon application. Use 40 to 60 psi.
Fusilade 2000 plus Oil Concentrate --or-- Poast plus Oil Concentrate	.1 to .2 2 pt .2 2 pt	3/4 to 1½ pt 2 pt 1 pt 2 pt	5 to 40 5 to 20	Controls all annual grasses including seedling johnsongrass, shattercane, and volunteer corn. Will also control wirestem muhly. Apply when annual grasses are 2 to 8 inches tall, and to volunteer corn less than 10 to 20 inches tall. See labels for these materials for use rates and stage of growth for the various grass species. Use 40 to 60 psi. In most cases when Fusilade or Poast are tank-mixed with Basagran and/or Blazer some reduction of grass control will result. A tank-mix should be used only when the broadleaf and grass weeds are at the optimum stage of development for best kill. Otherwise, use separate applications. In separate applications when Poast or Fusilade are applied first wait at least 2 to 3 days before applying Basagran and/or Blazer. If Basagran is applied first, wait 2 to 3 days before applying Poast or Fusilade; however, if Blazer or a combination of Blazer and Basagran are applied first, wait at least 7 days before applying Poast or Fusilade.
Fusilade 2000 plus Oil Concentrate -- or -- Poast plus Oil Concentrate	.2 + .125 2 pt + 2 pt .3 + .2 2 pt + 2 pt	1½ + 1 pt 2 pt + 2 pt 1½ pt + 1 pt 2 pt + 2 pt	5 to 40 5 to 20	Controls perennial grasses such as rhizome johnsongrass and quackgrass. Apply the first application when johnsongrass is 12 to 15 inches tall, and quackgrass and wirestem muhly is 6 to 8 inches tall. Wait 14 to 21 days to make the second application. For johnsongrass, if regrowth occurs from the base of dead plants or if new growth occurs, the second application should be made. If a soybean canopy is well developed 21 days after the first application, a second treatment may not be needed. An alternative approach to control rhizome johnsongrass with Fusilade is to use a planned split application (1 pt/A + 1 pt/A). For quackgrass, the second application must be applied for best results. These treatments will usually eliminate all rhizome johnsongrass. In following seasons, be certain to use herbicides that have excellent activity on seedling johnsongrass. With quackgrass, these treatments usually eliminate the competition completely during the season. However, only 60 to 70% of rhizome kill will usually be obtained, and two seasons are required for complete rhizome eradication. Do not use Basagran or Blazer with Fusilade or Poast when controlling perennial grasses such as quackgrass and rhizome johnsongrass. See remarks above when applying sequentially with Basagran or Blazer. Use 40 to 60 psi.
Roundup When used in a Recirculating Sprayer or Wick Applicator.	See label for amount of Roundup and water to use on various weed species.			Will clean up tall growing weeds, including johnsongrass, volunteer corn, shattercane, cocklebur, and giant ragweed. Apply when weeds are at least 6 inches taller than soybeans. For heavy infestations, a second application in the opposite direction may be needed for best results with wick applicators. **Do not** allow any direct contact with soybeans or other desirable plants as they may also be killed.

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
POSTEMERGENCE - (continued)				
Rescue plus Surfactant	1¼/.05	6 pt	10 to 20	Rescue is a prepackage-mix of Alanap-L and 2,4-DB amine. This treatment will reduce weed infestation and make harvest easier, and salvage some soybean yield. It is not intended to be used as a primary weed control program. It is intended to help clean up weed control failures. Apply Rescue **after** soybeans are 18 inches tall. This treatment will control or suppress cocklebur, giant ragweed, and volunteer sunflower. Also shows some activity on pigweed, lambsquarter, jimsonweed, common ragweed, and annual morningglory. Has no activity on grasses. Use 40 to 50 psi.
DIRECTED POSTEMERGENCE				
Sencor/Lexone plus	¼ to ½	4L: 1/2 to 1 pt DF: 1/3 to 2/3 lb	10 to 40	Use as a **directed postemergence** application only. For use as a follow-up treatment to soil applied herbicides to control burcucumber, annual morningglory, other escaped weeds such as jimsonweed, cocklebur, giant ragweed, and annual grasses, and to burn off perennial vines. Sencor/Lexone will provide better control of burcucumber. Sencor/Lexone will also provide better residual control of cocklebur, jimsonweed and giant ragweed. Use Lorox/Linex to control eastern black nightshade. Apply when soybeans are a minimum of 8 inches tall, and direct the spray to the bottom 3 inches of the soybean stem. **Do not** allow spray to contact the growing terminals. Upright growing weeds should be less than 4 inches tall. Vines should be sprayed before they start climbing on the soybeans. Perennial vines will be burnt back and their vigor reduced, but underground roots will not be killed. **Do not** use when symptoms of Phytopthora root rot are present as severe injury may occur. In Ohio Sencor/Lexone has a 24C clearance for this treatment; therefore a user should secure a 24C label from the supplier.
Butoxone or Butyrac 200	.2 .2	13 oz 13 oz		
plus				
Surfactant or Oil Concentrate	¼% 2 pt	¼% 2 pt		
-- or --				
Lorox/Linex plus	¼ to ½	50W: ½ to 1 lb 4L: ½ to 1 pt	10 to 40	
Butoxone or Butyrac 200	.2 .2	13 oz 13 oz		
plus				
Surfactant or Oil Concentrate	¼% 2 pt	¼% 2 pt		
NARROW ROW SOYBEANS				
Any of the soil applied herbicide programs previously discussed can be used in narrow row soybeans, and they will provide adequate control of grasses and small seeded broadleaf weeds, such as pigweed, lambsquarter, common ragweed, smartweed, and eastern black nightshade. However, there are several large seeded broadleaf weeds such as jimsonweed, cocklebur, giant ragweed, annual morningglory, and velvetleaf that are not adequately controlled with soil applied herbicides. The use of postemergence broadleaf herbicides is often needed to control these weeds. The following herbicide program is designed to control these weeds. This program will only work in narrow rows (20 inch rows or less). It can also be used to control small seeded broadleaf weeds in soybeans.				
Preplant Incorporate				See previous remarks for the use of all these herbicides. Incorporate Prowl, Treflan, Lasso, or Dual before planting. Use Prowl or Treflan if yellow nutsedge or eastern black nightshade are not present in the field. If these two weeds are present, Lasso ro Dual should be used. Apply Basagran, Blazer, or Dyanap 21 to 28 days after planting. (28 days for plantings made in late April or early May, and 21 days for plantings made after May 7). The postemergence herbicide used depends on the weeds present. These materials can be applied up to 4 inch tall weeds. Add 2 oz/A of Butoxone or Butyrac 200 to Basagran, Blazer, or Dyanap as the weeds approach or slightly exceed the maximum control size as listed on the herbicide labels. Do not spot treat the field if weeds do not appear to be present. Be certain to spray the entire field. This program not only provides control of these large seeded broadleaf weeds; but also eliminates possible injury from soil applied broadleaf herbicides, and broadleaf weed control problems in fields with various soil types. Poast or Fusilade could be used if perennial grasses are present or if sufficient annual grasses escaped the earlier treatment to merit the cost of these postemergence grass materials.
Prowl or Treflan	3/4 to 1¼ ½ to 1½	1½ to 3 pt 1 to 2½ pt	15 or more	
--or--				
Shallow Incorporate				
Lasso or Dual	3 2½ to 3	6 pt 2½ to 3 pt	15 or more	
Followed By A Postemergence Application of				
Basagran plus	1	2 pt	20 to 40	
Oil Concentrate	2 pt	2 pt		
--or--				
Blazer	½	2 pt	20 to 40	
--or--				
Dyanap	1½ to 3	4 to 6 pt	8 to 10	
DOUBLE-CROP REDUCED OR NO-TILL SOYBEANS				
Paraquat or Gramoxone plus Surfactant	½ ½	1 pt 1 pt	15 or more	Controls already emerged weeds and most annual broadleaves grasses. Apply immediately after planting. **Do not** apply afte soybeans are up. Increase Lorox/Linex rate to 1½ lb active/A soils above 3% organic matter. Decrease Sencor/Lexone rate

(continued)

Herbicide Recommendations for Soybeans *(continued)*

Herbicide	Active Ingredient (lb/A)	Formulated Product per Acre	Water Overall (gal/A)	Remarks
DOUBLE-CROP REDUCED OR NO-TILL SOYBEANS - (continued)				
plus Lorox/Linex --or-- Paraquat or Gramoxone plus Surfactant plus Sencor/Lexone	1 ¼ ¼ ½	 50W: 2 lb 4L: 2 pt 4L: 1 pt DF: 2/3 lb		¼ lb active/A on soils below 2% organic matter. Reduce Sencor/Lexone rate or use Lorox/Linex if soil pH is above 7.5 or if any atrazine carryover. If grasses are anticipated as a major weed problem or if soybeans are planted in rows wider than 15 inches, add Lasso (2 to 2½ lb active/A), Dual (2 to 2½ lb active/A), Prowl (3/4 to 1¼ lb active/A), or Surflan (3/4 to 1¼ lb active/A) to the spray mixture. Surflan will provide fair to good control to volunteer wheat. **Bronco** at 8 to 10 pt/A substituted for Paraquat/Gramoxone plus Lasso, will control annual grasses and suppress perennials such as quackgrass, johnsongrass and Canada thistle. Bronco is a prepackaged mix of Roundup and Lasso. Use postemergence herbicides (see section in conventional tillage soybeans) to deal with other weed problems as they develop.
—— FULL SEASON REDUCED OR NO-TILL SOYBEANS ——				
Avoid making a meadow harvest and planting soybeans into untilled stubble as any alfalfa or clover that may regrow with the soybeans cannot be controlled. Also, corn will better utilize any soil nitrogen that will become available after killing off the meadow. Avoid sites with extensive infestations of perennial broadleaf weeds, as herbicides are not available to control most of these weeds, especially after the crop emerges. Controlling all weeds that are present at planting is essential in no-till soybean production. Any herbicide program that is used must be able to control all weeds that are present at planting.				
Surflan (Early application)	1 to 1½	2 to 3 pts		Surflan can be applied in the fall or early spring directly over undisturbed stubble from previous crops. It will control annual grasses and several broadleaf species. Application can begin anytime after harvest in the fall up to spring seeding; however, in the spring Surflan should be applied before the annual broadleaf and grass weeds begin to germinate. The soil should not be tilled between the early Surflan application and soybean planting. Use follow-up herbicide application such as Sencor/Lexone or Lorox/Linex at planting to control and provide residual activity on broadleaf weeds. If broadleaf weeds are present, apply 2,4-D as suggested above. **Caution**--Do not apply Surflan to frozen or snow covered ground.
Paraquat or Gramoxone plus Surfactant plus Sencor/Lexone plus Lasso or Dual or Prowl or Surflan	¼ to ½ ¼ to ½ ¼ to 5/8 2 to 3 2 to 2½ 3/4 to 1¼ 3/4 to 1¼	1 to 2 pt 1 to 2 pt 4L: ½ to 1½ pt DF: 1/3 to 5/6 lb 4 to 6 pt 2 to 2½ pt 1½ to 2½ pt 75W: 1 to 1 2/3 lb 4AS: 1½ to 2½ pt	20 or more	Controls already emerged annual weeds and most annual broadleaves and grasses. Apply before or immediately after planting. **Do not** apply after soybeans are up. Use ½ lb active/A of Paraquat or Gramoxone if there is heavy weed growth or a cover crop present at planting. A split application of half the material applied 7 days apart will often provide better burndown of heavy weed growth or a cover crop. If yellow nutsedge or eastern black nightshade is present, use Lasso or Dual at 3 lb active/A. Prowl or Surflan will have fair to good activity on seedling johnsongrass. Reduce Sencor/Lexone rate or substitute **Lorox/Linex** (½ to 1 lb active/A) if soil pH is 7.5 or above or if any atrazine carryover. Plant soybeans at least 1½ inches deep. To control or suppress perennials such as quackgrass, johnsongrass, Canada thistle and clover, substitute 1½ to 2 qt/A of **Roundup** for the Paraquat/Gramoxone. Use postemergence herbicides (see section in conventional tillage soybeans) to deal with other weed problems as they develop.
Bronco plus Surfactant plus Sencor/Lexone	3.6 to 4.5 ¼ to 5/8	8 to 10 pt 2 qts/100 gal spray solution 4L: ½ to 1½ pt DF: 1/3 to 5/6 lb	10 to 20	Controls already emerged annual weeds and most annual broadleaves and grasses. Will suppress perennials that are present when Bronco is applied. **Do not** apply after soybeans are up. Bronco is a prepackage-mix of Roundup and Lasso (1 to 2.6 ratio). To improve control of perennial weeds, particularly grasses such as quackgrass, apply Bronco at 10 pt/A or spike the Bronco tank-mix with **Roundup** (1 1/3 pt/A). If yellow nutsedge or eastern black nightshade is a problem, apply Bronco rate at 10 pt/A or spike the Bronco tank-mix with **Lasso** (1 pt/A). Reduce Sencor/Lexone rate or substitute **Lorox/Linex** (½ to 1 lb active/A) if soil pH is 7.5 or above or if any atrazine carryover. Plant soybeans at least 1½ inches deep. Use postemergence herbicides (see section in conventional tillage soybeans) to deal with other weed problems as they develop.
Roundup	1½ to 2	4 to 6 pt	20 or more	Use with same residual herbicides listed with Paraquat or Gramoxone when emerged perennial weeds, such as quackgrass, wirestem muhly, Canada thistle, perennial vines, etc. are present at the time of planting.

SMALL GRAINS

Fertilizer Recommendations

Nitrogen - Spring nitrogen top dress for wheat and barley should be applied between March 15 and April 15 depending on the location in Ohio. If top-dressed too early and a freeze occurs after dormancy is broken, stand may be reduced.

Recommended Nitrogen for Small Grains (lb N/A)

Crop		Yield Goal (Bu/A)		
Wheat		50	70[1]	90[1]
Barley		65	90	115
Oats		100	130	160
Spring Application	(Wheat)	40[2]	75[2]	110[2]
Spring Application	(Barley)	55[2]	95[2]	135[2]
Spring Application	(Oats)	60[2]	90[2]	125[2]

[1]Use short, stiff-strawed varieties.

[2]Reduce nitrogen rate by 30 lbs. per acre on dark-colored soils.

Examples of Phosphorus (expressed as lb P_2O_5/A) **Recommended for Small Grains** (grain removal only)

Soil Test Value	Crop	Yield Goals (Bu/A)		
	Wheat	50	70	90
	Oats	100	130	160
lb P/A		Annual Recommendation		
10		105	115	130
20		90	100	115
30		75	85	100
40		65	75	90
50		50	60	75
60-90		35	45	60
100		20	30	45

Underlined numbers are the approximate amounts of crop removal.

Examples of Potassium (expressed as K_2O/A) **Recommended for Small Grain** (grain removal only)

Crop		Yield Goals (Bu/A)								
Wheat		50			70			90		
Oats		100			130			160		
Soil Test		C.E.C.			C.E.C.			C.E.C.		
Value		10	20	30	10	20	30	10	20	30
lb K/A		Annual Recommendation								
50		110	130	150	120	140	160	130	150	170
150		70	90	110	80	100	120	90	110	130
250		30	50	70	40	60	80	50	70	90
350		20	20	30	30	30	40	40	40	50
450		0	20	20	0	20	30	20	30	40
550		0	0	0	0	0	0	0	0	20

Underlined numbers are the approximate amounts of crop removal.

Source: *Ohio Agronomy Guide*, pp. 41-42, 62, 64-66

FORAGES

Conventional Seedings with a Small Grain Crop

Make forage seedings in fall or spring sown small grains as early in the spring as practical to enhance seeding success. Make all spring seedings of forage legumes and grasses in the March-April period in southern Ohio and during April in northern Ohio.

Early spring seedings of forages in winter grains assist the forage seedlings to beome established before the grain begins rapid spring growth; however, competition from the winter grains is still serious.

Early Removal of the Small Grain as silage, pasture or hay decreases the period of competition to the forage seedings and increases the vigor of the forage stand. This is an excellent alternative for sloping fields where soil erosion may be a hazard. Harvest the small grain at the early heading to milk stage of development.

Summer (August) Seedings. Alfalfa, smooth bromegrass, orchard-grass and timothy are well adapted to August seeding. Successful seedings of tall fescue and red clover have been made in Ohio when seeded in early August. When making summer seedings, a small grain crop is not used.

August seeding of forages has several advantages. It provides a second chance to establish a crop if spring seedings fail or if conditions prevent getting the seeding done in spring. It can follow the harvesting of a small grain, a means of double cropping, while keeping the soil protected with a crop.

Examples of Phosphorus (expressed as lb P_2O_5/A) **and Potassium** (expressed as lb K_2O/A) **Recommended for Seedings of Forage and/or Perennial Tall Grasses**

Phosphorus		Potassium			
Soil Test Value (lb P/A)	Fertilizer Application[1] (P_2O_5)	Soil Test Value (lb K/A)	Fertilizer Application (K_2O)[1] C.E.C. 10	20	30
			Annual Recommendation		
5	95	50	130	150	170
15	85	150	90	110	130
25	75	250	50	70	90
35	65	350	40	40	50
55	45	450	0	30	40
60-90	40	550	0	0	0

[1]For spring seeded alfalfa alone increase phosphorus recommendation by 40 lbs P_2O_5/A and potassium by 180 lbs K_2O/A.

Examples of Nitrogen Recommended for Seedings of Forage Legumes and/or Perennial Tall Grasses

Seeding	lb N/A
Legumes	10
Legume—Grass	20
Grasses	30

Forage Fertilizer Recommendations

Examples of Phosphorus (expressed as lb P_2O_5/A) Recommended for Forage Legumes and/or Tall Grasses (including annual forages)

Soil Test Value	Yield Goals (T/A) 4.0	6.0	8.0
lb P/A	Annual Recommendation[1]		
5	105	135	150
15	95	125	150
25	85	115	140
35	75	105	130
55	55	85	110
60-90	50	80	105

Underlined numbers are the approximate amounts of crop removal.

Examples of Potassium (expressed as lb K_2O/A) Recommended for Forage Legumes and/or Tall Grasses (including annual forages)

Soil Test Value	Yield Goals (T/A) 4.0 C.E.C. 10	20	30	6.0 C.E.C. 10	20	30	8.0 C.E.C. 10	20	30
lb K/A	Annual Recommendation[1]								
50	330	350	370	450	470	490	570	590	610
150	290	310	330	410	430	450	530	550	570
250	250	270	290	370	390	410	490	510	530
350	240	240	250	360	360	370	480	480	490
450	210	230	240	330	350	360	450	470	480
550	170	190	210	290	310	330	410	430	450

Underlined numbers are the approximate amounts of crop removal.

Examples of Nitrogen Recommended for Forage Legumes and/or Perennial Tall Grasses

Alfalfa, Red Clover (% of Stand[1])	Yield Goals (T/A) 3.5 or less	over 3.5
	Annual Application—lb N/A[2]	
More than 40	0	0
20-40	75	125
Less than 20	125	175

[1] Assume grass occupies space not occupied by legumes.

[2] Make split applications of N in the early spring and after first harvest. Liquid N should be applied in early spring or immediately following foliage removal.

HARVEST MANAGEMENT

Harvesting Effects on Alfalfa

	T./A.[1]	Crude Protein %			
Alfalfa					
5/25, 6/30, 8/5, 9/10	5.8	19	16	16	20
6/1, 7/16, 8/30	5.8	17	14	18	
Alfalfa - Orchardgrass					
5/25, 6/30, 8/5, 9/10	5.8	13	16	16	19
6/1, 7/16, 8/30	6.9	10	14	16	

"Flemish"-type alfalfa and late-maturing orchardgrass.

[1] 12% Moisture—Wooster, Ohio.

Source: R. W. Van Keuren, "Ohio Dairy Day Report," 1977, p. 46.

Recommended Harvest Dates — First-Cutting Legume - Grass Mixtures

Forage Mixture	CUTTING SCHEDULE A[1] Southern Ohio	Central Ohio	Northern Ohio	CUTTING SCHEDULE B[2] Southern Ohio	Central Ohio	Northern Ohio
Alfalfa-Common Orchardgrass	May 15-20	May 18-23	May 23-28	May 20-25	May 25-30	June 1-5
Alfalfa-Bromegrass	May 20-25	May 23-28	May 28-June 5	May 28-June 5	June 1-5	June 5-15
Alfalfa-Timothy	May 20-25	May 23-28	May 28-June 5	May 28-June 7	June 1-10	June 5-15
Red Clover-Timothy	May 24-June 5	June 1-10	June 1-15	May 25-June 5	June 1-10	June 5-15
Birdsfoot Trefoil-Timothy	May 20-June 1	May 25-June 15	June 1-20	June 1-10	June 5-15	June 10-20

[1] CUTTING SCHEDULE A—Forage cut during these periods will be of high quality. Dry matter yields will be lower than would be received from later harvests; however, yields of digestible dry matter per acre will equal or exceed those from later harvests.

Harvesting at these early dates may result in some loss of alfalfa stands. Stand reductions will be greater on first-year than on second-year meadows. The risk of losing alfalfa stands can be reduced by maintaining soil fertility and lime at high levels. "Flemish" alfalfas are adapted to earlier harvest.

[2] CUTTING SCHEDULE B—Harvesting at these dates will produce large quantities of medium quality forage. Digestibility will be lower than from earlier harvests.

These dates may be followed in these situations: For first-year hay on fields to remain in sod two or more years; for long-lay sods where it is important to keep legume stands for several years; where soil pH and fertility levels are less than optimum; where a late fall cutting may have been taken; winter injured fields; north facing slopes.

Source: *Ohio Agronomy Guide*, p. 67

SEEDING MIXTURES AND RATES

Seeding	Legumes and Grasses lb/A[1]	Notes
		Mixtures for Hay, Silage, or Rotational Grazed Pasture
A	Alfalfa 12	Alfalfa seeded alone may be more weedy, less winter hardy and may lodge more than alfalfa-grass mixtures. May be used on well drained, fertile, well managed sites.
B	Alfalfa 10 with Timothy 1-2 (Fall)--4 (Spring) or Smooth Bromegrass 6 or Orchardgrass 1-4	Most forage seedings in Ohio are a grass-legume mixture. Seeding some fields to alfalfa-orchardgrass, others to alfalfa-bromegrass, and others to alfalfa-timothy will permit spreading the first harvest over a period of two weeks without serious loss of quality. Orchardgrass seeding rate may be reduced to 1-2 pounds per acre where an alfalfa dominant mixture is desired.
C	Alfalfa 7 and Red Clover 3 with Timothy 1-2 (Fall)--4 (Spring) or Smooth Bromegrass 6 or Orchardgrass 1-4	Red clover is more tolerant than alfalfa to heavy shading by grain crops. These mixtures are recommended for seedings in wheat and other winter grains, and for use on fields where restricted soil drainage or low pH may reduce stands and growth of alfalfa.
D	Red Clover 8 with Timothy 1-2 (Fall)--4 (Spring) or Smooth Bromegrass 6 or Orchardgrass 1-4	These mixtures should be used on fields which will not produce satisfactory stands and yields of alfalfa or short rotation sites. After the first harvest year, there usually will be little or no clover in the stand and the seeding should be treated as a pure stand of grass.
E	Birdsfoot Trefoil 6 with Timothy 4	On some poorly drained soils of northeastern Ohio, birdsfoot trefoil produces higher yields than alfalfa. Where alfalfa does well, it yields 20 to 40 per cent more than birdsfoot trefoil. Upright-growing strains of birdsfoot trefoil, such as Viking, should be used for hay. In southern Ohio, birdsfoot trefoil stands are generally short-lived except where natural reseeding occurs.
		Mixtures for Long-lay Pastures
F	Orchardgrass 6-8 or Tall Fescue 10-15	Add ladino white clover--1/2 to 1 lb/A--where a ladino-grass pasture is desired. There is some danger of bloat when cattle are grazing ladino white clover-grass pastures. Ladino white clover in this mixture increases livestock acceptability of tall fescue. 10 lb. of tall fescue is sufficient for pasture establishment in most situations. 15 lb. may be advisable in potential areas of severe soil erosion and for no-tillage seeding.
G	Birdsfoot Trefoil 6 with Kentucky Bluegrass 2	Kentucky bluegrass--1 to 2 lb/A--should be substituted for timothy where a birdsfoot trefoil-bluegrass sod is desired in the shortest possible time. On fields which had good bluegrass sod prior to the start of the seedbed preparation, it is not necessary to sow a grass with birdsfoot trefoil. Bluegrass from the old sod will quickly re-establish to form a birdsfoot trefoil-bluegrass sod. Low-growing strains of birdsfoot trefoil, such as Empire, should be used for pasture. This pasture mix primarily adapted to Northern Ohio.
H	Reed Canarygrass 10	Reed canarygrass is recommended for use in areas too wet to support other forage grasses. Reed canarygrass will also produce high yields on well-drained sites, but it is less palatable than other species which can be grown.
I	Korean Lespedeza 8	Korean lespedeza broadcast over pastures in southern Ohio in which there is considerable bare ground will increase summer and fall production of such pastures.
J	Crownvetch 5-10	May require 1-4 years to obtain a productive stand. Timothy or bluegrass may be added to the seeding.

[1]These seeding rate recommendations assume the use of good quality seed with high percent germination, and adequate seedbed preparation in the case of conventional seedings or adequate seed-soil contact in the case of no-tillage seedings.)

Source: *Ohio Agronomy Guide*, p. 63

PASTURE

PASTURE CALENDAR GUIDE

This is only a guide to be used in forage program planning.

Grazing days for the year and by months is based on the anticipated yields and for the various indicated crops for one cow equivalent (one animal unit). An animal unit is the equivalent of one cow (1000 pounds of animal) in feed consumption; one dairy or beef cow, two heifers or two beef steers, five ewes, one horse, six sows.

An animal unit of pasture in any month is approximately the amount of pasture which a mature dairy or beef animal will eat in a month of grazing. It is considered to be 600 pounds of dry matter, containing 400 pounds of T.D.N.

Grasses	Annual Hay Yield Equiv. Lbs.	Total A. U. Grazing Days	Animal Unit Grazing Days Per Acre Per Month											
			Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Bluegrass Pasture														
Untreated—very poor	1000	25	..	9	8	2	1	3	2	..	..	..	..	..
Untreated—poor	2000	50	..	18	16	4	2	6	4	..	..	..	..	..
Untreated—fair	3000	75	..	22	21	9	4	10	9	..	..	..	..	..
Treated (L-P-K)—good	5000	105	6	30	28	10	5	12	10	4	..	..	..	..
Treated (L-N-P-K)—very good	7000	160	10	47	46	15	7	16	13	6	..	..	..	..
Extended Grazing	7000	115	8	15	15	15	15	15	15	10	7	..	..	..
Deferred Winter Grazing	7000	100	6	34	18	..	..	8	10	10	10	4	..	..
Deferred Summer Grazing	7000	95	..	..	..	50	30	10	5	..	..	..	..	..
Orchardgrass + N	8500	210	18	50	50	30	25	17	15	5	..	..	..	..
Tall Fescue + N	11000	280	30	70	60	20	15	40	25	15	5	..	..	..
Tall Fescue + N—Winter Pasture	11000	220	20	..	Bale	..	..	..	..	20	45	45	45	45
Timothy + N	6400	160	16	53	48	7	4	17	10	5	..	..	..	..
Smooth Bromegrass + N	8000	200	18	62	58	8	6	19	21	8	..	..	..	..

Legumes	Annual Hay Yield Equiv. Lbs.	Total A. U. Grazing Days	Animal Unit Grazing Days Per Acre Per Month											
			Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Alfalfa—grass mixture														
Pastured all season*	6000	120	3	33	41	18	18	7	..	..	..	..	..	..
	8000	180	5	50	46	35	32	12	..	..	..	..	..	..
	12000	260	5	70	70	45	40	15	..	15	..	..	..	..
After 1st Hay Crop*	6000**	60	..	..	..	26	26	8	..	..	..	..	..	..
	8000**	90	..	..	..	40	38	12	..	..	..	..	..	..
	12000**	125	..	..	5	50	40	15	..	15	..	..	..	..
Red Clover—grass mixture														
Pastured all season*	3000	70	2	20	25	10	8	5	..	..	..	..	..	..
	6000	130	3	38	42	17	20	10	..	..	..	..	..	..
	8000	180	5	50	50	30	28	12	..	5	..	..	..	..
After Hay Crop*	3000**	20	..	..	..	8	8	4	..	..	..	..	..	..
	6000**	40	..	..	..	16	16	8	..	..	..	..	..	..
	8000**	90	..	..	..	40	33	12	..	5	..	..	..	..
Birdsfoot Trefoil—grass	7000	120	5	26	35	29	18	7	..	..	..	..	..	..
	8000	180	5	43	45	40	27	15	..	5	..	..	..	..
New Meadow Seedings	1000	20	..	..	..	..	14	6	..	..	..	..	..	..

Other	Annual Hay Yield Equiv. Lbs.	Total A. U. Grazing Days	Animal Unit Grazing Days Per Acre Per Month											
			Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Sudangrass	7500	145	..	..	15	50	47	26	7	..	..	..	..	..
Winter Barley or Rye	3000	80	19	30	..	..	..	..	6	20	5	..	..	..
Wheat	2000	45	15	20	..	..	..	..	..	10	..	..	..	..
Oats	4000	60	..	25	35	..	..	..	..	..	..	..	..	..
Gleaning Corn Stalks	4000	60	..	..	..	..	..	..	..	30	30	..	..	..

* Approximately 30 additional days of grazing can be obtained during September and October if the meadow is not to be maintained for hay the following year.

** Including yield of first harvest.

Source: *Ohio Agronomy Guide*, p. 75

FERTILIZING BLUEGRASS PASTURE

Examples of Nitrogen Recommended

Time of Application	Yield Goals (T/A)	
	2.0 or less	Over 2.0
	Annual Application lb N/A	
Spring	40	60
Late Summer (September 1)	40	60

Examples of Phosphorus (expressed as lb P_2O_5/A) and Potassium (expressed as lb K_2O/A) Recommended

Phosphorus		Potassium			
			Fertilizer Application C.E.C.[1]		
Soil Test Value	Fertilizer Application	Soil Test Value	10	20	30
lb P/A		lb K/A	Annual Application		
5	60	50	95	105	115
15	40	150	75	85	95
25	20	200 or Above	0	0	0
30 or above	0				

[1] Cation Exchange Capacity.

When buildup is requested, buildup recommendations for bluegrass are made to 30 for P and 200 for K.

Source: *Ohio Agronomy Guide*, p. 74

SUGGESTED RATES AND DATES OF SEEDING IMPORTANT OHIO CROPS

Crop	Pounds of Seed Per Bushel	Rate to Plant (lb/A)	DATE TO PLANT	
			In Northern Ohio	In Southern Ohio
Alfalfa	60	12	Mar. 10-May 15 or Aug. 1-Sept. 1	Mar. 1-May 1 or Aug. 1-Sept. 15
Barley, Winter	48	96-120	Sept. 15-25	Sept. 15-Oct. 5
Birdsfoot Trefoil	60	6	Mar. 10-May 1	Mar. 1-May 1
Bromegrass	14	10	Aug. 1-Sept. 1 or March-April	Aug. 1-Sept. 15 or March-April
Corn, dent	56	16-22	Apr. 15-May 10	Apr. 10-May 10
Corn, pop	56	3-6	Apr. 25-May 10	Apr. 15-May 10
Clover, alsike	60	4-5	March-April or August	March-April or August
Clover, Medium or mammoth red	60	8-10	March-April or August	March-April or August
Clover, ladino	60	1-2	March-April	March or August
Fescue, tall	10-30	10-15	March-April or August	March-April or August
Lespedeza, Korean	40-45	6-12	Not recommended	Feb. 15-Mar. 31
Oats, spring	32	64-80	March-April	Mar. 1-Apr. 15
Orchardgrass	14	6	March-Apr. 30 or August	March-April or August
Rye	56	112	Sept. 1-Oct. 15	Sept. 10-Oct. 20
Ryegrass		Soil Cover - 15-20 Forage - 5	June 15-Aug. 15 or March-April	June 15-Oct. 1 or March-April
Sorghum, forage	50	12-15	May 10-30	May 5-30
Sorghum, grain	56	8-12	May 10-30	May 5-25
Sorghum-Sudangrass	40-50	35	May 15-June 15	May 5-June 15
Soybeans	60	Solid 2.5 seeds/ft.	May 1-20	Apr. 20-May 10
Sudangrass	40	25	May 15-June 15	May 5-June 15
Sweetclover	60	10-12	Mar. 15-Apr. 30	Mar. 15-Apr. 15
Timothy	45	1-2 (fall) or 4 (spring)	August-September or March-April	August-Oct. 15 or March-April
Wheat	60	75-105	Sept. 29-Oct. 15	Oct. 7-22

Source: *Ohio Agronomy Guide*, inside back cover

UNIT II

LIVESTOCK PRODUCTION DATA

A. In this unit, data will be provided for you to use with your students. These data will help them complete the livestock report and livestock budgets in the farm management problem. (*Other sources of data can be used if you so desire.*)

B. It is suggested that you make these data or comparable data available to your students in the vo ag department.

C. The sources of data for this unit include:

1. Excerpts from *Livestock Nutrition and Feeding* (Ohio Agricultural Education Curriculum Materials Service)

   Nutrient Composition of Feed Stuffs - pages 123-130
   Guidelines in Selecting Rations - pages 138-144

2. Excerpts from *Livestock Breeding* (Ohio Agricultural Education Curriculum Materials Service)

   Age of Puberty, Mating Capacity, and Recommended Breeding Load for Male Livestock - pages 48, 53
   Age When Heat Begins, and Duration of Heat - pages 61, 62
   Duration of Gestation - page 90

3. Excerpt from *The Farm Management Guide* (Doane's Agricultural Service, Inc.)

   Livestock Space Requirements - pages 147-148

4. Excerpts from *Modern Livestock and Poultry Production* (Delmar Publishers)

   Animal Breeding - pages 98-99
   Horses - Feeding, Management, Housing, and Tack - page 444
   Poultry-Feeding, Management, Housing, and Equipment - pages 514-517, 521, 526-530

NUTRIENT COMPOSITION OF FEED STUFFS COMMONLY FED CATTLE AND SHEEP

Feedstuff	Dry Matter %	Total (Crude) Protein %	Digestible Protein %	Crude Fiber %	Total Digestible Nutrients %	Calcium %	Phosphorus %
Dry Roughage							
Alfalfa hay 1/10 bloom	90	17.5	12.8	23.0	53	1.61	.27
Alfalfa hay 1/2 bloom	90	15.0	10.2	30.0	50	1.50	.27
Alfalfa hay full bloom	90	13.0	9.3	32.0	47	1.13	.20
Alfalfa hay 1/2 grass (avg.)	90	12.0	7.7	30.0	50	.80	.20
Alfalfa hay stemmy	90	12.0	8.2	36.0	46	1.07	.20
Broomgrass hay (avg.)	90	10.4	5.3	31.0	49	.42	.20
Clover, red, (avg.)	88	12.0	7.2	27.0	52	1.28	.20
Clover, red, leafy	88	13.5	9.2	23.0	53	1.47	.20
Clover, red, stemmy	88	10.4	5.8	34.0	49	1.12	.20
Clover and timothy (30-50% clover)	88	8.6	4.7	30.0	50	1.70	.23
Corn stover	90	5.9	2.1	32.0	48	.40	.07
Misc. hay less than 30% legume	88	8.4	4.5	31.0	48	.59	.18
Oat, straw	90	4.1	1.3	36.0	45	.24	.09
Orchard grass hay	88	11.2	6.7	30.0	50	.40	.33
Timothy hay before bloom	89	9.7	6.1	28.0	54	.60	.20
Timothy hay mid-bloom	89	7.5	4.0	28.0	54	.36	.16
Timothy hay late bloom	89	5.3	2.1	31.0	42	.20	.15
Timothy hay (avg.)	89.0	6.6	3.0	30.0	49.0	.35	.14
Silage							
Alfalfa, wilted	36.0	6.4	4.5	10.9	22.0	.51	.12
Corn dough stage	29.0	2.3	1.2	6.3	19.0	.07	.06
Corn milk stage	26.0	1.8	0.8	5.8	18.0	.07	.06
Corn with 10 lb. urea/ton	30.0	4.3	2.6	6.3	22.0	.10	.06
Grass-legume mixture	29.0	3.4	1.7	9.1	13.0	.23	.08
Oat	30.0	3.6	2.5	10.0	16.0	.07	.06

Source: *Livestock Nutrition and Feeding*, pp. 123-126

(continued)

Nutrient Composition of Feed Stuffs *(continued)*

Feedstuff	Dry Matter %	Total (Crude) Protein %	Digestible Protein %	Fiber %	Total Digestible Nutrients %	Calcium %	Phosphorus %
Concentrates							
Beet molasses	77.0	8.4	4.4	0	61.0	.16	.03
Brewers grain (dried)	92.4	25.9	20.7	14.0	66.0	.27	.50
Brewers' grain (wet)	23.7	5.7	4.2	4.0	16.1	.07	.12
Cane molasses	74.0	3.0	1.7	0	67.0	.66	.08
Corn and cob meal	86.0	7.4	5.4	9.0	73.2	.04	.22
Corn and cob meal (30% moisture)	70.0	6.0	4.8	6.0	60.0	0	0
Corn no. 2 shelled	89.0	8.9	6.8	2.3	81.0	.02	.31
Corn distillers' grains (dried)	92.0	27.0	20.0	13.0	82.7	.09	.37
Corn distillers' grains with solubles	92.0	27.0	20.0	9.0	81.0	.17	.68
Corn gluten feed	90.4	25.0	22.0	7.0	75.4	.46	.77
Corn gluten meal	90.7	42.9	36.5	4.0	80.0	.16	.40
Cottonseed meal solvent process	91.4	41.6	34.5	11.0	66.1	.15	1.10
Linseed meal solvent process	90.9	35.1	29.5	9.0	71.0	.40	.83
Oats, ground	90.2	12.0	8.3	11.0	70.1	.09	.33
Oats, ground light weight	91.2	9.0	7.0	15.0	59.8	0	0
Oatmeal	90.8	16.1	14.5	3.0	91.4	.07	.46
Rye	89.5	12.6	10.0	3.0	76.5	.10	.33
Soybean meal (expeller process)	91.7	50.4	46.4	3.0	79.4	.27	.63
Soybean meal (solvent process)	90.3	45.8	42.1	6.0	77.2	.32	.67
Soybean seeds	90.0	37.9	33.7	5.0	87.6	.25	.59
Wheat, soft red winter	90.0	11.1	9.2	2.2	80.0	.04	.29
Wheat bran	89.1	16.0	13.0	10.0	65.9	.14	1.17
Wheat middlings	89.8	17.2	14.3	8.0	76.9	.15	.91

(continued)

Nutrient Composition of Feedstuffs *(continued)*

Feedstuff	Dry Matter %	Total (Crude) Protein %	Digestible Protein %	Crude Fiber %	Total Digestible Nutrients %	Calcium %	Phosphorus %
Wheat screenings (good grade)	90.4	13.9	10.0	4.0	68.7	.44	.39
Yeast, brewers' dried	93.4	44.6	38.4	3.0	72.4	.13	1.43
Mineral Supplements							
Bone meal, Steamed						30.00	14.00
Dicalcium phosphate						22.00	18.00
Defluorinated rock phosphate						32.00	18.00
High calcium Limestone, ground						38.00	.02

METABOLIZABLE ENERGY, VITAMIN, AND MINERAL CONTENT OF SWINE FEEDS

Feed	Metabolizable energy (k/cal per lb.)	Calcium %	Phosphorus %	Vitamin A (IU/lb.)	Riboflavin (mg per lb.)	Niacin (mg per lb.)	Pantothenic Acid (mg per lb.)	Choline (mg per lb.)	Vitamin B_{12} (mg per lb.)
GRAINS									
Barley	1305	0.08	0.42		0.9	26.1	3.00	468.2	
Corn — yellow	1539	0.02	0.31	1000	0.6	12.00	1.80	90.9	
Oats	1210	0.10	0.35		0.7	7.2	5.90	487.7	
Rye	1396	0.06	0.34		0.72	0.54	3.12		
Sorghum (milo)	1465	0.04	0.29		0.6	19.4	5.20	308.2	
Wheat	1486	0.14	1.17		1.4	95.1	13.20	449.1	
PROTEIN SUPPLEMENTS									
Alfalfa leaf meal (dehydrated)	920	1.52	0.27	100,000	7.10	24.9	14.90	735.4	
Alfalfa leaf meal (sun cured)	600	1.33	0.24	10,000	5.60	20.8	13.60	690.0	
Blood meal (dried)	920	0.45	0.37		1.90	14.3	2.40	126.8	
Buttermilk (dried)	1368	1.34	0.94		14.10	3.9	13.70	821.8	
Cottonseed meal (solvent process)	1062	0.16	1.20		2.30	18.0	6.40	1300.0	
Fish meal (anchovy)	1110	4.50	2.85		2.00	19.3	2.00	772.7	
Fish meal (menhadden)	1170	5.49	2.81		2.20	24.4	4.00	1400.0	
Linseed meal (solvent process)	1188	0.40	0.83		1.30	13.7	2.90	556.8	
Meat and bone meal (50% protein)	1104	10.57	5.07		2.00	21.7	1.70	995.0	20.3
Peanut meal (solvent process)	1325	0.20	0.65		5.00	77.3	24.10	909.1	
Skim milk (dried)	1524	1.26	1.03		9.10	5.2	15.30	648.2	19.0
Soybean meal (44% protein)	1281	0.32	0.67		1.50	12.2	6.60	1246.8	
Soybean meal (50% protein)	1359	0.26	0.62		1.40	9.8	6.60	1255.0	

Source: *Livestock Nutrition and Feeding*, pp. 127-128

(continued)

Metabolizable Energy, Vitamin, and Mineral Content of Swine Feeds *(continued)*

Feed	Metabolizable energy (k/cal per lb.)	Calcium %	Phosphorus %	Vitamin A (IU/lb.)	Riboflavin (mg per lb.)	Niacin (mg per lb.)	Pantothenic Acid (mg per lb.)	Choline (mg per lb.)	Vitamin B_{12}
Tankage	931	5.94	3.17		1.10	17.8	1.10	985.9	
Whey (dried)	1,447	0.87	0.79		13.60	5.1	21.70	1100.0	
Grain byproducts brewers grains (dried)	775	0.27	0.50		0.70	19.7	3.90	721.4	
Corn gluten meal (41% protein)		0.16	0.40		0.70	22.7	4.70	150.0	
Corn gluten feed		0.30	0.70		0.40	30.0	2.60	217.3	
Hominy feed		0.05	0.53		0.90		3.40	195.4	
Wheat bran	1,053	0.14	1.17		1.40	95.1	13.20	449.1	
Wheat middlings	1,339	0.08	0.52		0.70	23.9	6.20	363.6	

AVERAGE NUTRIENT COMPOSITION OF FEEDS COMMONLY USED IN HORSE RATIONS*

Feed	As Fed Basis					
	Digestible Energy (Mcal./lb.)	Protein (%)	Digestible Protein (%)	Calcium gm/lb.	Phosphorus gm/lb.	Vitamin A (thousands IU/lb.)**
Oats	1.25	11.75	7.39	.09	.35	
Shelled Corn	1.62	8.90	4.71	.02		
Corn and Cob Meal	1.35	8.10	4.00	.04	.27	
Barley	1.48	11.57	7.29	.08	.42	
Wheat Bran	1.04	16.02	11.48	.14	1.17	
Soybean Oil Meal	1.42	45.84	39.78	.32	.67	
Linseed Oil Meal	1.38	35.13	29.58	.40	.83	
Alfalfa Hay (early-bloom)	0.95	16.56	11.07	1.13	.21	20.8
Alfalfa Hay (mid-bloom)	0.91	15.25	9.81	1.20	.20	11.9
Alfalfa Hay (full-bloom)	0.83	13.94	8.68	1.12	.18	5.9
Alfalfa Hay (mature)	0.80	12.40	7.02	.65	.15	2.6
Timothy Hay (mid-bloom)	0.78	7.35	3.19	.36	.17	1.7
Timothy Hay (late-bloom)	0.76	7.30	3.17	.33	.16	1.6
Red Clover Hay	0.88	12.79	7.48	1.31	.21	5.7
Bone Meal, steamed				30.00	.14	
Ground Limestone				38.00	.02	
Deflourinated Rock Phosphate				32.00	18.00	
Dicalcium Phosphate				32.00	18.00	

*Adapted from *Nutrient Requirements of Horses*. National Academy of Sciences, Washington, D.C., 1973.

**One mg of beta-carotene equals 400 International Units of Vitamin A.

Source: *Livestock Nutrition and Feeding*, p. 130

GUIDELINES IN SELECTING RATIONS

Livestock are fed under a rather wide range of conditions. Before a proper ration is selected, the feeding conditions must be identified. As an example, dairy cattle should be fed a different concentrate ration if they are being fed free choice high quality alfalfa hay than if they were receiving their roughage feed from blue grass pasture.

The guidelines given are often referred to as "rules of thumb." However, most of the guidelines are a result of extensive research by livestock nutritionists. Perhaps these guidelines are referred to as "rules of thumb" because they are somewhat general in their recommendations. In some situations, more should be fed than the guideline suggests. In other situations, less should be fed than the guideline suggests. The old livestock feeding adage, "The eye of the master fattens his cattle," may be appropriate to remember in feeding livestock. The following guidelines serve only as a starting point in selecting a ration.

1. Trace mineral salt should be fed free choice.
2. The protein in concentrates averages 80 percent digestible.
3. Dry feeds contain about 90 percent dry matter. Hay contains about 80 to 85 percent dry matter.
4. Water in a clean, fresh condition should be provided free choice.

Guidelines for Dairy Cattle

LACTATING COWS

Dry Roughage

Feed (on the average) about 2 percent of the cow's body weight. For example, a 1,500 pound cow would receive 30 pounds of hay. The amount will vary from 1.5 percent (older animals) to 3.5 percent (younger animals).

Estimated daily intake for amount of roughage, in addition to body weight, is determined by the quality of the roughage fed. As a guide for estimating the consumption of hay on dry matter basis and fed free choice, the following rules of thumb are suggested.

Roughage Quality	Daily Intake (% of body weight)
Excellent	3.0
Good	2.5
Average	2.0
Fair	1.5
Poor	1.0

It is important to remember the following when feeding roughage to dairy cattle: If cows are allowed to consume all the roughage they want, they may not have the capacity to consume enough concentrates to meet the energy requirements of high milk production. So, sometimes a maximum roughage consumption level must be established. In some states, the Dairy Herd Improvement Association (DHIA) uses 1.75 percent of body weight as the maximum amount allowed.

Silage can replace half the hay. However, three times as much silage must be fed to replace the hay. For example, if 12 pounds of hay is the total roughage, 6 pounds of it can be replaced with 18 pounds of silage.

Concentrates

The concentrate mixture of feeds will vary with the kind of roughage fed. A higher protein concentrate mixture will be required when a low quality roughage is fed.

Concentrates are fed to provide the nutrients that are provided by roughage. The "rules of thumb" for concentrate feeding are based upon average intakes of average quality hay. These general "rules of thumb" are:

- One pound of concentrate for every 3 pounds of milk produced by high testing breeds (4.5 to 5.5 percent butterfat), and/or
- One pound of concentrate for every 4 pounds of milk produced by low testing breeds (3.0 to 4.5 percent butterfat)

These "rules of thumb" work very well for high testing cows producing about 30 pounds of milk and low testing cows producing 35 to 40 pounds of milk. *Thus, high producing cows are underfed and low producing cows are overfed.*

More specific recommendations are as follows:

For high testing cows (butterfat percentage 4.5 to 5.5) —

One pound of concentrate for each 2 pounds of milk produced above that level of milk production expected from feeding only roughage. High testing cows can be expected to produce 15 to 20 pounds of milk per day on roughage alone. Therefore, a cow producing 40 pounds of 4.5 to 5.5

Source: *Livestock Nutrition and Feeding*, pp. 138-144

percent butterfat should be fed approximately 10 to 12 pounds of concentrate.

For low testing cows (butterfat percentage 3.0 to 4.5) —

One pound of concentrate for each 2.5 pounds of milk produced above that level of milk production expected from feeding only roughage. Low testing cows can be expected to produce 20 to 25 pounds of milk per day on roughage alone. Therefore, a cow producing 60 pounds of 3.0 to 4.5 percent butterfat should be fed approximately 14 to 16 pounds of concentrate.

The protein percentage, crude or digestible, whichever value is used, should be adjusted, depending upon the kind and quality of roughage fed.

The following table gives suggested percentages of digestible protein needed in concentrate rations with the different quality roughages cows are fed.

Quality of Roughage	Percent Digestible Protein in Concentrate Mixture
High quality legume hay or legume silage	9-10
Average quality legume hay	12-13
One-half grass hay stover, corn or sorghum silage	15-16
No legume — roughage extremely low in protein	17-20

Pasture

For dairy cows on good quality pasture, feed two-thirds as much concentrate as when the roughage is hay or hay and silage. If pasture is of poor quality, the protein percentage of the concentrate should be adjusted. The percent protein in the concentrate mixture should be determined by the quality of the pasture.

Quality of Pasture	Percent Protein in Concentrate Mixture
Excellent, young, green pasture	8-9
Grass-legume pasture— grass near ripening	12-14
Coarse grass—legume, grasses	12-13
Fully ripened grass pasture	14-15

DRY COWS

Thin dry cows may be fed up to 4 to 6 pounds of home-grown grains per day. The amount of grain to feed should be determined by the condition of the cow. Cows in good condition should be fed little or no grain unless the roughage is of poor quality.

Soybean meal, or other protein supplement, may be needed to balance the protein when dry cows are fed only corn silage.

Two weeks before calving, grain amount should be increased to 15 to 18 pounds daily. This will help cows get accustomed to high grain consumption, which will be required after calving. It will also help to reduce the occurrence of the disease ketosis (a metabolic disorder).

After calving, cows should be brought to peak milk production as soon as possible. This can be done by feeding slightly more grain than required and continuing until there is no increase in milk production. Then the amount of grain fed should be adjusted to the milk production.

YOUNG DAIRY ANIMALS

Birth to Four Months of Age

Colostrum is the first milk produced by the cow after freshening. It is important to the calf. Colostrum is rich in proteins, vitamins, and minerals. The antibodies it contains help protect the calf from diseases.

Usually the calf is left with the cow (its mother) for the first three days.

The suggested milk feeding schedule is:

Age (Days)	Amount of Milk to Feed Daily
0-3	4-6 lb. colostrum or nurse cow
4-24	6-8 lb.
25-31	4-6 lb.

Recommendations:

- Feed whole milk or equivalent amount of milk replacer.
- Feed in two equal feedings.
- Feed low amount for small breeds; high amount for large breeds.

Four to Twelve Months of Age

Rumen capacity at this age is not sufficient to allow the animal to meet energy needs from roughage alone. Feed 1 to 3 pounds of grain, depending upon the age, size, and condition of the animal.

Twelve Months to Calving

- Feed grain only if the roughage is of poor quality.
- Feed free choice mineral mixture.
- Two months before freshening, start feeding grain 4 to 6 pounds daily; gradually increase to accustom heifers to high grain consumption at calving.

Guidelines for Beef Cattle

BEEF COW HERD

Summer (Pasture) Feeding

The pasture will supply most of the nutrients needed. Feed mineral mixture free choice. (Mineral mixture: 1 part steamed bone meal, 1 part trace mineral salt, 1 part dicalcium phosphate.) Salt may be fed free choice.

If the pasture is short or inadequate:

- 15 pounds of corn silage per head per day will substitute for one-third of the pasture acreage.
- 30 pounds of corn silage will make up for two-thirds of the pasture acreage.
- 5 pounds of good quality hay will give the same results as 15 pounds of corn silage.
- 10 pounds of good quality hay will give the same results as 30 pounds of corn silage.

Winter Feeding

- Feed cows dry roughage on the average of 2 percent of their body weight. (Range is from 1.5 to 3.5 percent.)
- Replace one pound of hay with three pounds of silage.
- Supply pregnant and lactacting cows with the following amounts of nutrients:

Nutrient	Gestation	Lactation
Protein - percent of ration	6-7	9-10
Protein - pounds daily	0.8-1.5	1.8-2.3
TDN - percent of ration	45-50	55-60
TDN - pounds daily	6-10	11-15

MARKET CATTLE

- Feed 2 percent of body weight in grain per day. (A full feed of grain is commonly considered to be approximately 2 pounds of grain per 100 pounds of body weight.)
- Feed 1 to 2 pounds of protein supplement per day.
- Feed 4 to 6 pounds of hay per day.
- Steers on full feed should gain approximately 1.5 to 2.5 pounds per day.

Guidelines for Sheep

EWES

Ewes should be fed until fifteen weeks into the gestation period.

- Feed 3 to 3.5 percent of their body weight in day per day. A 100-pound ewe should receive 4 to 6 pounds of hay per day.
- Feed 1/3 pound protein supplement per day when corn silage is fed.

For the different kinds of roughage, use the following guidelines:

Roughage	Amount in Pounds
Legume hay	3.5
Grass hay	4.0
Corn silage	7.5

Breeding Period

Ewes that are on legume pasture should be removed two weeks before breeding starts and placed on grass pasture.

Feed ½ pound of grain (corn-oats) two weeks before and one week after breeding season starts.

Gestation Period

For the first 3½ months of pregnancy, good quality pasture or hay (fed free choice) is adequate.

For the last 1½ months of pregnancy (in winter or spring lambing), feed:

- 4-5 pounds hay plus ½-¾ pound shelled corn, or
- 2-3 pounds hay plus 1½-2 pounds shelled corn, or

- 7-8 pounds corn silage plus 1 pound shelled corn and ¼ to ½ pound protein supplement.

Hay should be of at least average quality - legume or legume-grass mixture.

Lactation Period

Feed the ewe lightly for a day or two after lambing. Provide plenty of fresh water.

By the third day, feed:

- 3-3½ pounds hay plus 3-3½ pounds shelled corn, or
- 9-11 pounds corn silage plus 1½-2 pounds shelled corn plus ½ pound supplement.

LAMBS

Start creep feeding when lambs are approximately 10 days of age. Ration: 6 parts cracked corn, 2 parts oats or bran, 2 parts protein supplement.

When lambs are 4 weeks old, feed a concentrate mixture containing 18 percent crude protein. Continue this until lambs are weaned.

Late lambs can be produced for market from grazing on good pasture.

Finishing lambs on dry lot should be fed 2 pounds shelled corn, 2 pounds legume hay, ½ pound protein supplement daily. Lambs on full feed should gain approximately ½ pound per day.

Guidelines for Swine

SOWS AND GILTS

Gestation

Restrict feed intake to 4 to 5 pounds per head daily of 14 percent crude protein diet.

Farrowing

Three to five days before farrowing, add to concentrate mixture 1/3 pound wheat bran or oats or alfalfa meal, or a combination of the three, to provide bulk. The feeding level of bulk ration is sows, 8-10 pounds; gilts, 6-8 pounds. Continue this ration, fed free choice, for 3 to 5 days after farrowing.

Lactation

Self-feed a 14 percent crude protein ration high in energy and low in fiber.

MARKET SWINE

Young Pigs

Feed 18 to 20 percent crude protein concentrate as creep ration to pigs of ages 3 to 6 weeks. At least half the grain in the ration should be corn.

Antibiotic included in the ration should be 100 to 200 grams per ton of feed.

Growing Pigs — to 75 pounds

The ration should contain 16 percent crude protein. A mixture of corn and a supplement which supplies enough of the essential amino acids is a suitable ration to self-feed.

Amount of antibiotic needed varies from 5 to 100 grams per ton of feed.

Finishing Market Swine 75-125 pounds

The ration should contain 14-15 percent crude protein for self-feeding.

If an antibiotic is used, supply 20-50 grams per ton of ration.

Finishing Market Swine 125 pounds to market

The ration should contain 12-14 percent crude protein for self-feeding.

If an antibiotic is used, supply 20-50 grams per ton of ration.

If market swine are hand fed, feed 4 to 4.5 percent of their body weight per day. Swine weighing 50 to 200 pounds and on full feed should have an average daily gain of 1½ pounds.

Guidelines for Horses (Mature)

Idle - in pasture, feed free choice 2 pounds of hay for each 100 pounds body weight.

Light Work (under 3 hours per day) — Feed ¼ to ½ pound of grain and 1¼ to 1½ pounds of hay for each 100 pounds of body weight.

Medium Work (3 to 5 hours per day) — Feed 1 pound of grain and 1 pound of hay for each 100 pounds of body weight.

Heavy Work (over 5 hours per day) — Feed 1¼ to 1½ pounds of grain and 1 pound of hay for each 100 pounds of body weight. Mineral mixtures may be mixed with the grain ration or fed free choice. Loose salt should be fed free choice.

Guidelines for Poultry

LAYING HENS
Leghorns

Age (weeks)	Body Weight (pounds)	Feed Consumption (pounds/week)	Typical Egg Production* (hen-day %)
22	3.14	1.16	10
24	3.31	1.31	38
26	3.47	1.47	64
30	3.80	1.70	88
40	4.00	1.70	80
50	4.12	1.69	74
60	4.19	1.66	68
70	4.19	1.63	62

* *Example* (as explanation): A producer with 100 birds at 30 weeks of age could expect to receive 88 eggs per day from that group of laying hens. (100 birds x 88% from column = 88 eggs)

LEGHORN PULLETS

Age in Weeks	Body Weight	Feed Consumption (pounds per 2-week period)
0	0.08	0.20
2	0.30	0.40
4	0.60	0.80
6	0.99	1.15
8	1.37	1.43
10	1.74	1.70
12	2.09	1.90
14	2.34	2.03
16	2.56	2.03
18	2.78	2.03
20	3.00	2.03

Starter ration	19 percent protein	1-6 weeks
Growing ration	16 percent protein	7-12 weeks
Developer ration	13 percent protein	13-18 weeks

TURKEYS

Age in Weeks	Large Toms		Large Hens	
	Average Live Weight (in pounds)	Total Feed Required (in pounds)	Average Live Weight (in pounds)	Total Feed Required (in pounds)
1	0.24	0.2	0.24	0.2
2	0.60	0.7	0.53	0.6
3	1.28	1.7	1.04	1.5
4	2.2	3.0	1.54	2.5
5	3.3	4.5	2.4	3.8
6	4.4	6.4	3.5	5.5
7	5.7	8.8	4.6	7.4
8	7.3	11.7	5.7	9.7
9	8.8	15.0	6.8	12.3
10	10.4	18.9	8.1	15.3
11	12.1	23.3	9.5	18.5
12	13.9	28.3	10.6	22.0
13	15.7	33.8	11.7	25.8
14	17.6	39.6	12.8	29.6
15	19.4	46.0	13.9	33.6
16	21.4	52.8	14.8	37.9
17	23.1	59.6	15.7	42.4
18	24.9	66.9	16.5	46.9
19	26.7	74.4	17.2	51.7
20	28.2	82.4	17.9	56.6

Pre-starter ration	28 percent protein	1-4 weeks
Starter ration	26 percent protein	5-8 weeks
Finishing ration	22 percent protein	9-12 weeks
- with changes	19 percent protein	13-16 weeks
	16.5 percent protein	17-20 weeks
Market at about 20 weeks		

BROILERS

Age in Weeks	Male Broiler Chickens (pounds)		Female Broiler Chickens (pounds)	
	Average Live Weight	Weekly Feed Consumption	Average Live Weight	Weekly Feed Consumption
1	0.29	0.26	0.26	0.24
2	0.70	0.57	0.66	0.53
3	1.23	0.86	1.14	0.78
4	1.90	1.18	1.74	1.10
5	2.76	1.63	2.45	1.42
6	3.73	2.16	3.15	1.76
7	4.63	2.41	3.85	2.01
8	5.56	2.67	4.54	2.14
9	6.45	2.91	5.18	2.23

Starter ration	23 percent protein	0-3 weeks
Finishing ration	20 percent protein	3-6 weeks
Withdrawal ration	18 percent protein	6-7 weeks

Source: *Nutrient Requirements of Poultry*, 8th revised edition, National Academy Press, 2101 Constitution Ave. NW, Washington, DC 20418, 1984

Livestock Space Requirements*

These space requirements and design recommendations were furnished by the Midwest Plan Service and are based on currently popular types of buildings and equipment.

Beef Cattle

Feedlot, sq. ft./head

20' in barn and 30' in lot	Lot surfaced, cattle have free access to shelter
50'	Lot surfaced, no shelter
150'-800'	Lot unsurfaced except around waterers, along bunks and open-front buildings, with a connecting strip
20'-25'	Sunshade

Buildings with Feedlots, sq. ft./head

20'-25'	600 lbs. to market
15'-20'	Calves to 600 lbs.
1/2 ton/head	Bedding

Cold Confinement Buildings, sq. ft./head

30'	Solid floor, bedded
17'-18'	Solid floor, flushing flume
17'-18'	Totally or partly slotted
100'	Calving pen
1 pen/12 cows	Calving space

Feeders, in./head along feeder

All animals eat at once:

18"-22"	Calves to 600 lbs.
22"-26"	600 lbs. to market
26"-30"	Mature cows
14"-18"	Calves

Feed always available:

4"-6"	Hay or silage
3"-4"	Grain or supplement
6"	Grain or silage
1 space/ 5 calves	Creep or supplement

Bunk throat height
- Up to 18" for calves, 22" for feeders and mature cows
- Use 30" height only if hogs will run with cattle

Bunk width
- 48" if fed from both sides of bunk
- 54"-60" if bunk is divided by mechanical feeder
- 18" bottom width if fed from one side of bunk

Waterers

40 head/available water space in drylot

Corrals

600 lbs.	600-1,200 lbs.	1,200+ lbs.
	----------sq. ft./head----------	
14'	17'	20' Holding
6'	10'	12' Crowding

Isolation & Sick Pens

40-50 sq. ft./head

Pens for 2%-5% of herd

Mounds

25 sq. ft./head Minimum

Hogs

Feeder and Waterer Space

Self-feeders: one space/5 pigs

Supplement feeders: one space/15 pigs

Sow feeders: 1'/sow self-feed, 2'/sow all fed at once

Waterers: one space/20 to 25 pigs

Building Floor Space

Sows and boars: 15 to 20 sq. ft.

Pigs starting thru finishing:
- 12 to 60 lbs.-4 sq. ft.
- 60 to 125 lbs.-6 sq. ft.
- 125 to market-8 sq. ft.
- 100 to market: 5 sq. ft. under roof, + 13 sq. ft. on outside paved lot

Sow and litter:
- 26 sq. ft.: Slotted floor, full confinement
- 32 sq. ft. inside + 42 sq. ft. outside for indoor-outdoor system

Pasture Space

10 gestating sows/acre

7 sows with litters/acre

50 to 100 growing-finishing pigs/acre depending on fertility.

Shade Space

15 to 20 sq. ft./sow

20 to 30 sq. ft./sow and litter

4 sq. ft./pig to 100 lbs.

6 sq. ft./pig over 100 lbs.

Floor and Lot Slopes

Slotted floors: usually flat

Farrowing, solid floors:
- 1/2" to 3/4"/ft. without bedding
- 1/4" to 1/2"/ft. with bedding

Finishing: 1/2" to 3/4"/ft.

Paved lots: 1/4" to 1"/ft.

Paved feeding floors:
- Indoors: 1/4"/ft. minimum
- Outdoors: 1"/ft.

Building alleys:
- 1/2"/ft. cross slope for crown
- 1/10" to 1/4"/ft. to drain

Gutters and pits:
- 1"/25' to 1"/100' to drains
- 1.5% slope for flush gutters

Slot Widths, in slotted floors

New-born pigs[1]	3/8" and 1"
12 to 60 lbs.[2]	3/4" to 1"
60 to market	1"
Sows and Boars	1"-1-1/4"

[1] Cover slots during farrowing; 1" wide slots behind sows, 3/8" elsewhere

[2] 3" width preferred over wider slats

(continued)

* Used with the permission of Midwest Plan Service, Ames, IA 50011; and Doane's Agricultural Service.
Source: The Farm Management Guide, pp. 147-148

Dairy Cattle

Recommended stall barn dimensions

Alley width	
Flat manger-feed alley	5'8"-6'6"
Feed alley with step manger	4'0"-4'6"
Service alley with barn cleaner	6'0"
Cross alley[1]	4'6"
Manger width	
Cows under 1,200 lbs.	20"
Cows 1,200 lbs. or more	24"-27"
Gutters	
Width[2]	16" or 18"
Depth, stall side	11"-16"
Depth, alley side	11"-14"

[1] Taper the end stalls inward 6" at the front for added turning room for a feed cart.
[2] Or as required for barn cleaner.

Free stall dimensions

Calves	Width x Length
6 weeks to 4 months	2'0" x 4'6"
5 to 7 months	2'6" x 5'0"
Heifers	
8 months to freshening	3'0" x 5'6"
Cows (average herd weight)	
1,000 lbs.	3'6" x 6'10"
1,200 lbs.	3'9" x 7'0"
1,400 lbs.	4'0" x 7'0"
1,600 lbs.	4'0" x 7'6"

Typical free stall alley widths

Feeding alley between a bunk and the front of a stall row 9'-10'

Feeding alley between a bunk and the back of stall row 10'-12'

Resting alley between the backs of 2 stall rows:
- Solid floors 8'-10'
- Slotted floors 6'-9'

Cow stall platform sizes

Use electric cow trainers

	Stanchion stalls		Tie stalls	
Cow weight	Width	Length	Width	Length
Under 1,200 lbs.	4'0"	5'6"	4'0"	5'9"
1,400 lbs.	4'6"	5'9"	4'6"	6'0"
Over 1,600 lbs.	Not recommended		5'0"	6'6"

Slat Spacing

Elevated calf stalls: 3/4" between 1x2"s on edge
Calves, wide slats: 1-1/4" slot
Cows, wide slats: 1-1/2"—1-3/4" slot

Feeders, in./head along feeder
All animals eat at once:
- 18"-22", calves to 600 lbs.
- 22"-26", heifers
- 26"-30", mature cows

Feed always available:
- 4"-6", hay or silage

Bunk capacity:
- 1—1-1/2 cu. ft./ft. of bunk length min. for animals fed twice daily.

Bunk throat height
- Up to 16" for calves, 20" for heifers, 24" for mature cows, 30" for mature cows on unscraped, flat apron.

Bunk widths
- 48" if fed from both sides of bunk
- 54"-60" if bunk is divided by mechanical feeder
- 18" bottom width if fed from one side of bunk

Waterers

40 head/available water space in confinement. Pave at least a 10' apron around waterers.

Sheep

Feeder space

Group-fed:
- 16"-20"/ewe
- 9"-12"/feeder lamb

Self-fed:
- 10"-12" silage, 8"-10" hay/ewe
- 3"-4"/feeder lamb

Lamb creep space:
- 1.5-2 sq. ft./lamb

Waterer space

Per automatic bowl
- 40-50 ewes or ewes with lambs
- 50-75 feeder lambs

Per ft. of tank perimeter
- 15-25 ewes or ewes with lambs
- 25-40 feeder lambs

Shelter space

Open-front building with lot:
- 10-12 sq. ft./ewe
- 12-16 sq. ft./ewe and lambs
- 6-8 sq. ft./feeder lamb

Lot:
- 25-40 sq. ft./ewe
- 25-40 sq. ft./ewe and lambs
- 15-20 sq. ft./feeder lamb

Solid floor (confinement):
- 12-16 sq. ft./ewe
- 15-20 sq. ft./ewe and lamb
- 8-10 sq. ft./feeder lamb

Slotted floor confinement:
- 8-10 sq. ft./ewe
- 10-12 sq. ft./ewe and lamb
- 4-5 sq. ft./feeder lamb

Lambing pens (jugs) 4'x4'x30" or 4-1/2'x4-1/2'x36"; provide grain and water

Nursery pens for 2 to 4-day old lambs before putting into group pens:
about 16'x16' for 20 ewes and 30 lambs

Detailed construction data and livestock building plans are available through the Midwest Plan Service and Extension Agricultural Engineers at several cooperating universities. Inquiries and requests for printed material can be made directly to: Midwest Plan Service Engineers, Dept. of Agricultural Engineering, 590 Woody Hayes Drive, Columbus, OH 43210.

SPACE REQUIREMENTS FOR POULTRY AND HORSES

Broilers

Feeder space -

100 linear inches per 100 birds, up to 2 weeks of age
300 linear inches per 100 birds, 2 to 6 weeks of age
350 linear inches per 100 birds, 7 weeks to market

Water space -

25 linear inches per 100 birds, up to 2 weeks of age
50 linear inches per 100 birds, 2 to 6 weeks of age
75 linear inches per 100 birds, 7 weeks to market

Shelter space -

20-30 square inches, up to 2 weeks of age
1 square foot, 2 weeks to market

Pullets

Feeder space -

100 linear inches per 100 birds, up to 2 weeks of age
200 linear inches per 100 birds, 2 to 6 weeks of age
250 linear inches per 100 birds, 7 to 12 weeks of age
300 linear inches per 100 birds, 13 to 20 weeks of age

Water space -

25 linear inches per 100 birds, up to 2 weeks of age
50 linear inches per 100 birds, 2 to 6 weeks of age
75 linear inches per 100 birds, 7 to 12 weeks of age
100 linear inches per 100 birds, 13 to 20 weeks of age

Shelter space -

20-30 square inches, first 7 to 8 weeks
45-55 square inches, 9 to 18 weeks

Laying Hens

Feeder space - 300 linear inches per 100 birds

Water space - 50 linear inches per 100 birds

Shelter space - 64 to 80 square inches per bird

Turkeys

Feeder space - 200-300 linear inches per 100 birds

Water space - 36 linear inches per 100 birds

Shelter space -

Range rearing, 125-250 birds per acre
On sandy soils, up to 1,000 birds per acre
Confinement - large toms, 5.5 square feet per bird
large hens, 3.5 square feet per bird
mixed flock, 4.5 square feet per bird

Horses

Feeder space - 3 to 4 linear feet per horse

Water space - a horse drinks 10 to 12 gallons per day; a supply of fresh water should be available at all times

Shelter space - an area 12 x 12 feet per horse

Source of data: several Extension publications

AGE OF PUBERTY IN MALE LIVESTOCK

	Age in Months
Cattle	8 - 12
Swine	5 - 7
Sheep	5 - 7
Horses	12 (breeding deferred till 24 mo.)

MATING CAPACITY OF SIRES

	Number of Females to Mate In a Breeding Season	
Animal	**Pasture Mating**	**Hand Mating**
Beef cattle:		
Yearling bull	10 - 12	20
2-year-old or over	25 - 30	30 - 50
Sheep:		
Ram lamb	10 - 12	10 - 20
Ram 18 months or over	20 - 25	30 - 50

MATING CAPACITY OF COCKEREL AND TOMS

Cockerel - Leghorn - 1 per 15 to 17 hens at mating time

Toms - artificial insemination is used due to low fertility with natural mating

RECOMMENDED BREEDING LOAD FOR BOARS

Age (Months)	Pen Mating	Mating by Hand*
7 or less	None	None
7 - 9	2 per week	2 per week
9 - 12	8 - 10 in 3-week period	15 - 20 in 3-week period
12 - 18	10 - 12 in 3-week period	20 - 25 in 3-week period
18 and over	12 - 15 in 3-week period	25 - 30 in 3-week period

*These are based on optimum control and distribution of matings throughout the period.

Source: *Livestock Breeding*, pp. 48, 53

AGE WHEN PUBERTY OCCURS

Heifer	4-8 months
Gilt	4-6 months
Ewe Lamb	7-10 months (or first fall season)
Horses	12-15 months
Chickens	22-26 weeks

DURATION OF HEAT PERIOD AND HEAT CYCLE

	Duration of Cycles (Days)		Duration of Heat	
	Average	Variation	Average	Variation
Cow	21	18 - 24	14 hrs.	8 - 30 hrs.
Sow	21	18 - 24	2 - 3 days	1 - 5 days
Ewe	16	14 - 20	35 hrs.	1 - 3 days
Mare	22	17- 30	6 days	2- 11 days

DURATION OF GESTATION

	Range in Days	Average Duration
Sheep	144-152	148 days (5 months)
Swine	98-124	114 days (3 months, 3 weeks, 3 days)
Cattle	278-288	283 days (9½ months)
Horses	310-370	336 days (11 months)
Goats	140-160	151 days (5 months)

Source: *Livestock Breeding*, pp. 61, 62, 90

UNIT III

EQUIPMENT AND SUPPLIES COST DATA

A. In this unit, data will be provided for you to use with your students. These data will help them complete the crop and livestock reporting sheets and the crop-livestock budgets. (*Other sources of data could be used if you so desire.*)

B. It is suggested that you make these data or comparable data available to your students as outlined in part II, pages 3-4.

C. The sources of data for this unit include:

Excerpts from *Livestock Budgets* (Ohio Cooperative Extension Service)

Buildings and Equipment Costs
Custom Hire Rates

Excerpts from *Tillage Systems* (Ohio Agricultural Education Curriculum Materials Service)

Estimates on tillage based on hours per acre, pages 25-35

List of new equipment costs from local dealers

List of supplies - fertilizer, chemicals, seeds - from local dealers

Summary of the grain market from a local elevator

BUILDINGS AND EQUIPMENT COST FOR LIVESTOCK

(for a production cycle or one year)

		1985 Cost	Your Cost
		Prices per unit	
Dairy	milk cow	$550.00	_____
	replacement heifer	50.00	_____
	veal	20.00	_____
Beef	feeders - 450 to 1050 lb. (9 mo. use)	35.00	_____
	backgrounding - 400 to 650 lb. (180 days)	25.00	_____
	cow & calf - cow on pasture most of the year	50.00	_____
Hogs	farrow (pasture system), 1 litter/yr.	60.00	_____
	farrow (high investment) - farrowing house, 2 litters/yr.	190.00	_____
	farrow (low investment) - unheated barns, 2 litters/yr.	130.00	_____
	finishing - 50 to 230 lb. hog (high investment)	12.00	_____
	finishing - 50 to 230 lb. hog (low investment)	7.00	_____
	farrow to finish (pasture system), 1 litter/yr.	110.00	_____
	farrow to finish (high investment), 2 litters/yr.	500.00	_____
	farrow to finish (low investment), 2 litters/yr.	210.00	_____
Poultry	layers (14 mo. cycle)	0.07/doz.	_____
	broilers (2 mo.)	0.12 ea.	_____
	turkey (5 mo.)	0.54 ea.	_____
Sheep	ewe and lamb budget	11.00	_____
	feeder lamb	2.00	_____
Horses	brood mares	70.00	_____
	stable for training standard breeds	70.00	_____

Note: Keep in mind that the prices given are 1985 prices. The last column, "Your Cost," is to be used for price adjustments needed as economic conditions change.

EQUIPMENT COST AND CUSTOM HIRE RATES

1985 Machinery Cost - *new prices**		Your Cost
Tractor 100 h.p. — pull 5-16"	$42,000.00	_____
Tractor 70 h.p. — pull 4-16"	28,000.00	_____
Plow 5-16"	5,500.00	_____
Plow 4-16"	4,500.00	_____
Conservatill Chisel Plow 13'	5,900.00	_____
Chisel Plow	2,700.00	_____
Cultimulcher 12'	4,500.00	_____
Field Cultivator 18'	3,000.00	_____
Corn Planters per row	2,500.00	_____
6 Row Cultivator	2,500.00	_____
Disc Harrow 17'	3,600.00	_____
Combines - 4 row corn head and 13' grain table	60,000.00	_____

1985 Custom Hire Rates - *includes equipment, fuel, repairs, and one person on the equipment*		
Plow	$11.00/A	_____
Chisel	9.50/A	_____
Disc	6.00/A	_____
Planting - conventional	7.50/A	_____
Planting - no-till	12.00/A	_____
Grain Drill	6.00/A	_____
Combine	20.00/A	_____
Mowing and Conditioning	7.00/A	_____
Rake	4.00/A	_____
Baling - square bale	0.30/bale	_____
Baling - large round	6.00/bale	_____
Trucking Grain — 0-30 mi.	0.10/bu.	_____
Trucking Grain — over 30 mi.	0.14/bu.	_____

* This list of machinery and equipment is provided as a *guide* for students to use in preparing budgets. You may want to cut the prices 50-60% for used equipment.

Note: Keep in mind that the prices given are 1985 prices. The last column, "Your Cost," is to be used for price adjustments needed as economic conditions change.

ACRE-HOURS FOR TILLAGE IMPLEMENTS AND OTHER EQUIPMENT

Implement	Size	A/Hrs.	Hrs./A
Moldboard Plow	3-14"	1.53	0.67
	4-16"	2.33	0.43
	5-16"	2.91	0.34
	6-16"	3.50	0.29
Chisel Plow	10 ft.	4.36	0.23
	12 ft.	5.24	0.19
	15 ft.	6.55	0.15
	17 ft.	7.42	0.14
Disc Harrow	12 ft.	5.24	0.19
	16 ft.	6.98	0.14
	20 ft.	8.73	0.12
	24 ft.	10.47	0.10
Spring-tooth Harrow	12 ft.	5.24	0.19
	15 ft.	6.55	0.15
	18 ft.	7.86	0.13
Field Cultivator	12½ ft.	5.46	0.18
	15½ ft.	6.76	0.15
	18 ft.	7.86	0.13
	24 ft.	10.47	0.10
Spike-tooth Harrow	12 ft.	5.24	0.19
	18 ft.	7.86	0.13
	24 ft.	10.47	0.10
Cultipackers	12 ft.	5.24	0.19
	15 ft.	6.55	0.15
Rotary Hoes	4 row	6.79	0.15
	6 row	10.18	0.10
	8 row	13.58	0.07
Sprayers	8 row	7.27	0.14
Planters	4 row con.	3.70	0.27
	4 row N-T	3.70	0.27
	6 row N-T	5.56	0.18
	8 row N-T	7.14	0.14
Combines @ 3 m.p.h.	4-30's	2.60	0.39
	6-30's	3.90	0.26
	8-30's	5.00	0.20

Formula used to determine the above figures:

$$\text{A/Hrs.} = \frac{\text{Speed (m.p.h.)} \times \text{Width (ft.)} \times \text{Field Efficiency (\%)}}{825}$$

Assumptions used for arriving at figures above:

Tillage - 4.5 m.p.h., 80% field efficiency

Spraying and cultivation - 4.0 m.p.h., 75% field efficiency

Harvesting - 3.0 m.p.h., 70% field efficiency

Planting - 4.5 m.p.h., 70% field efficiency

COST OF FARM SUPPLIES

	1985 Cost	Your Cost
Herbicides		
2,4-D Amine	$8.50 gal.	
Aquazine	5.50 lb.	
Attrex 4L	8.50 gal.	
Attrex 80W	1.80 lb.	
Banvel	56.00 gal.	
Basagran	82.00 gal.	
Bladex 4L	18.50 gal.	
Bladex 80W	3.60 lb.	
Blazer	78.00 gal.	
Dual 8E	50.00 gal.	
Fusilade	245.00 gal.	
Lasso	22.00 gal.	
Lorox 50W	5.75 lb.	
Lorox 4L	45.00 gal.	
Paraquat CL	45.00 gal.	
Princep 80W	2.80 gal.	
Prowl	25.00 gal.	
Roundup	84.00 gal.	
Sencor 4L	100.00 gal.	
Sencor 50W	11.00 lb.	
Tordon 10K	12.00 lb.	
Stickers	13.00 gal.	
Crop Oil	5.80 gal.	
Poast	95.00 gal.	
Eradicane	29.00 gal.	
Seed		
Oats	5.50 bu.	
Beans	12.00 bu.	
Corn	68.00 / 80,000 kernels	

	1985 Cost	Your Cost
Seed *(continued)*		
Alfalfa	80.00 bu.	
Red Clover	60.00 bu.	
Wheat	7.50 bu.	
Spreading		
Dry Fertilizer	$3.00/A they do it	
Water and Herbicide	4.00/A they do it	
Spreader	2.50/A you do it	
Insecticides		
Dyfonate 20G	2.20 lb.	
Furadan 15G	1.70 lb.	
Lorsban 15G	1.50 lb.	
Sevin 50W	2.10 lb.	
Dry Fertilizers		
15-15-15	170.00 ton	
6-24-24	168.00 ton	
P 0-44-0	215.00 ton 25¢/lb.	
K 0-0-60	120.00 ton 11.5¢/lb.	
N 46-0-0	220.00 ton 24¢/lb.	
Lime	7.00 ton	
Liquid Fertilizers		
Liquid N, 28%	145.00 ton 26¢/lb.	
6-18-6	150.00 ton	
4-10-10	125.00 ton	

This list of farm supplies is provided as a *guide* for you and your students to use in preparing crop reports and budgets. These prices and products may vary from area to area in the state.

Note: Keep in mind that the prices given are 1985 prices. The last column, "Your Cost," is to be used for price adjustments needed as economic conditions change.

MARKETING DATA

	Prices - May 1986	Price Changes	New Crop Sept., Oct., Nov., Dec., 1986	Price Changes
GRAINS				
Corn	$2.10/bu	_____	$1.90/bu	_____
Soybeans	5.30/bu	_____	4.95/bu	_____
Wheat	3.70/bu	_____	3.20/bu	_____
Oats	1.10/bu	_____	———	———
Hay	60.00/ton	_____	———	———
LIVESTOCK AND POULTRY				
Steers	50¢/lb	_____		
Barrows and Gilts	52¢/lb	_____		
Lambs	74¢/lb	_____		
Broilers	42¢/lb	_____		
Eggs (large white)	51¢/doz	_____		
Turkeys	49¢/lb	_____		
Milk	$11.90/cwt	_____		

Note: You may want to consult *The Wall Street Journal*, the USDA Economic Research Service's *Livestock and Poultry Situation and Outlook Report*, or local newspapers for current and futures marketing information.

TRANSPARENCY MASTERS follow on the next pages.

LIME REQUIREMENTS TO INCREASE SOIL pH TO FOUR LEVELS

(in terms of T/A Ag-Ground Limestone, T.N.P. 90+, 8 inch Plow Depth)

	pH Levels			
	Mineral Soils			Organic Soils
Lime Test Index	7.0	6.5	6.0	5.2
	TONS PER ACRE - AG-GROUND LIMESTONE			
68	1.4	1.2	1.0	0.7
67	2.4	2.1	1.7	1.3
66	3.4	2.9	2.4	1.8
65	4.5	3.8	3.1	2.4
64	5.5	4.7	3.8	2.9
63	6.5	5.5	4.5	3.5
62	7.5	6.4	5.2	4.0
61	8.6	7.2	5.9	4.6
60	9.6	8.1	6.6	5.1
59	10.6	9.0	7.3	5.7
58	11.7	9.8	8.0	6.2
57	12.7	10.7	8.7	6.7
56	13.7	11.6	9.4	7.3
55	14.8	12.5	10.2	7.8
54	15.8	13.4	10.9	8.4
53	16.9	14.2	11.6	8.9
52	17.9	15.1	12.3	9.4
51	19.0	16.0	13.0	10.0
50	20.0	16.9	13.7	10.5
49	21.1	17.8	14.4	11.0
48	22.1	18.6	15.1	11.6

EQUIVALENT AMOUNTS OF LIMING MATERIALS
(based on T.N.P. and fineness)

Grade	T.N.P.	Fineness % Passing Mesh Size				Pounds to Equal 1 Ton of Agr'l. Ground Limestone 90 or Higher T.N.P.	% of Ag-Ground to Apply
		100	60	20	8		
AGRICULTURAL LIMESTONES AND/OR SLAG (air cooled)							
Hydrated	160+	90	95	98	100	1000	50
Hydrated	130-140	90	95	98	100	1200	60
Ag-Superfine	90+	80	95	100	100	1600	80
	80-89	80	95	100	100	1800	90
Ag-Pulverized	90+	60	70	95	100	1700	85
	80-89	60	70	95	100	1900	95
Ag-Ground (Base)	90+	40	50	70	95	2000	100
	80-89	40	50	70	95	2300	115
Ag-Fine Meal	90+	30	40	60	85	2500	125
	80-89	30	40	60	85	2800	140
Ag-Coarse Meal	90+	20	30	50	80	2900	145
	80-89	20	30	50	80	3200	160
Ag-Fine Screenings	90+	10	20	45	80	3400	170
	80-89	10	20	45	80	3800	190
Ag-Coarse Screenings	90+	5	15	40	80	4000	190
	80-89	5	15	40	80	4300	215
AGRICULTURAL GRANULATED SLAG (water cooled)							
Ag-Granulated Slag	90+	10	15	60	95	2000	100
	80-89	10	15	60	95	2300	115

ADJUSTMENTS IN LIMING RATION FOR DEPTH OF PLOWING

	Plowing Depth (inches)	Multiplying Factor
	3	0.38
	6	0.75
	7	0.88
Base	8	1.00
	9	1.13
	10	1.25
	11	1.38
	12	1.50

EXAMPLES OF NITROGEN RECOMMENDED FOR CORN

	Yield Goals (Bu/A)		
Previous Crop	**120**	**150**	**180**
	Annual Application lb N/A		
Forage legume	60	110	150
Grass crop	65	170	200
Soybeans	85	190	200
Continuous corn and other crops	115	200	200

EXAMPLES OF PHOSPHORUS (expressed as lb P_2O_5/A)
RECOMMENDED FOR CORN (Broadcast Program)

	Yield Goals (Bu/A)		
Soil Test Value	**120**	**150**	**180**
lb P/A	**Annual Recommendation**		
10	75	100	110
20	65	80	90
30-60	(45)	(60)	(70)
70	25	40	50
80	20	20	30
90	0	0	20
100	0	0	0

Circled numbers are the approximate amounts of crop removal.

EXPLANATION OF TM 5

Estimating Phosphorus Recommendations from Table

To estimate the amount of phosphorus needed in the annual recommendation for corn, the following assumptions will be used — yield goal of 150 bushels per acre and a soil test value of 15 pounds per acre. The transparency master shows that the yield goal falls under the 150 bushels per acre column and the 15 pounds per acre is between the 10 and 20 pounds per acre. The values in the table are as follows:

	150 bu/A
10 lb. P/A	100
20 lb. P/A	80

The soil test of the example of 15 pounds per acre is halfway between 10 and 20, therefore, the P_2O_5 recommendation is halfway between 100 and 80 or **90 pounds P_2O_5** per acre.

EXAMPLES OF POTASSIUM (expressed as lb K_2O/A)
RECOMMENDED FOR CORN (Broadcast Program)

	Yield Goals (Bu/A)								
	120 C.E.C.			150 C.E.C.			180 C.E.C.		
Soil Test Value	**10**	**20**	**30**	**10**	**20**	**30**	**10**	**20**	**30**
lb K/A	**Annual Recommendation**								
50	120	140	160	130	150	170	140	160	180
150	80	100	120	90	110	130	100	120	140
250	40	60	80	50	70	90	60	80	100
350	(30)	(30)	40	(40)	(40)	50	(50)	(50)	60
450	0	20	(30)	0	30	(40)	20	40	(50)
550	0	0	0	0	0	0	0	0	20

Circled numbers are the approximate amounts of crop removal.

EXPLANATION OF TM 6

Estimating Potassium Recommendations from Table

To estimate the amount of potassium needed, the following assumptions will be used — yield goal 150 bushels per acre, soil test value of 200 pounds K per acre and a CEC of 15. The table shows that the yield goal falls under the 150 bushels per acre column, the soil test value of 200 pounds K per acre is halfway between 150 and 250 in the pounds K per acre column, and the CEC of 15 is halfway between the 10 and 20 CEC columns. The values in the table are as follows:

	150 bu/A		
	C.E.C.		
lb K/A	10	20	30
150	90	110	
250	50	70	

After calculating for a CEC of 15, this segment of the table would be as follows:

	C.E.C.
lb K/A	15
150	100
250	60

Then to determine the annual recommendation of K_2O per acre for a 200-pound K per acre soil test value, simply find the midpoint between 100 and 60 or **80 pounds K_2O** per acre.

BUILDINGS AND EQUIPMENT COST FOR A FARM OPERATION

(for a production cycle or one year)

		1985 Cost	Your Cost
	Prices per Unit		
Dairy	milk cow	$550.00	_____
	replacement heifer	50.00	_____
	veal	20.00	_____
Beef	feeders - 450 to 1050 lb. (9 mo. use)	35.00	_____
	backgrounding - 400 to 650 lb. (180 days)	25.00	_____
	cow & calf - cow on pasture most of the year	50.00	_____
Hogs	farrow (pasture system), 1 litter/yr.	60.00	_____
	farrow (high investment) - farrowing house, 2 litters/yr.	190.00	_____
	farrow (low investment) - unheated barns, 2 litters/yr.	130.00	_____
	finishing - 50 to 230 lb. hog (high investment)	12.00	_____
	finishing - 50 to 230 lb. hog (low investment)	7.00	_____
	farrow to finish (pasture system), 1 litter/yr.	110.00	_____
	farrow to finish (high investment), 2 litters/yr.	500.00	_____
	farrow to finish (low investment), 2 litters/yr.	210.00	_____
Poultry	layers (14 mo. cycle)	0.07/doz.	_____
	broilers (2 mo.)	0.12 ea.	_____
	turkey (5 mo.)	0.54 ea.	_____
Sheep	ewe and lamb budget	11.00	_____
	feeder lamb	2.00	_____
Horses	brood mares	70.00	_____
	stable for training standard breeds	70.00	_____

EQUIPMENT COST

1985 Machinery Cost - new prices			**Your Cost**
Tractor 100 h.p. — pull 5-16"		$42,000.00	_____
Tractor 70 h.p. — pull 4-16"		28,000.00	_____
Plow 5-16"		5,500.00	_____
Plow 4-16"		4,500.00	_____
Conservatill Chisel Plow 13'		5,900.00	_____
Chisel Plow		2,700.00	_____
Cultimulcher 12'		4,500.00	_____
Field Cultivator 18'		3,000.00	_____
Corn Planters	per row	2,500.00	_____
6 Row Cultivator		2,500.00	_____
Disc Harrow 17'		3,600.00	_____
Combines - 4 row corn head and 13' grain table		60,000.00	_____

This list of machinery and equipment is provided as a *guide* for students to use in preparing budgets. You may want to cut the prices 50-60% for used equipment.

CUSTOM HIRE RATES

1985 Custom Hire Rates - includes equipment, fuel, repairs, and one person on the equipment		**Your Cost**
Plow	$11.00/A	_____
Chisel	9.50/A	_____
Disc	6.00/A	_____
Planting - conventional	7.50/A	_____
Planting - no-till	12.00/A	_____
Grain Drill	6.00/A	_____
Combine	20.00/A	_____
Mowing and Conditioning	7.00/A	_____
Rake	4.00/A	_____
Baling — square bale	0.30/bale	_____
Baling — large round	6.00/bale	_____
Trucking Grain — 0-30 mi.	0.10/bu.	_____
Trucking Grain — over 30 mi.	0.14/bu.	_____

ACRE-HOURS FOR TILLAGE IMPLEMENTS AND OTHER EQUIPMENT

Implement	Size	A/Hrs.	Hrs./A
Moldboard Plow	3-14"	1.53	0.67
	4-16"	2.33	0.43
	5-16"	2.91	0.34
	6-16"	3.50	0.29
Chisel Plow	10 ft.	4.36	0.23
	12 ft.	5.24	0.19
	15 ft.	6.55	0.15
	17 ft.	7.42	0.14
Disc Harrow	12 ft.	5.24	0.19
	16 ft.	6.98	0.14
	20 ft.	8.73	0.12
	24 ft.	10.47	0.10
Spring-tooth Harrow	12 ft.	5.24	0.19
	15 ft.	6.55	0.15
	18 ft.	7.86	0.13
Field Cultivator	12½ ft.	5.46	0.18
	15½ ft.	6.76	0.15
	18 ft.	7.86	0.13
	24 ft.	10.47	0.10

Formula used to determine the above figures:

$$\text{A/Hrs.} = \frac{\text{Speed (m.p.h.)} \times \text{Width (ft.)} \times \text{Field Efficiency (\%)}}{825}$$

Assumptions used for arriving at figures above:

Tillage - 4.5 m.p.h., 80% field efficiency

Spraying and cultivation - 4.0 m.p.h., 75% field efficiency

Harvesting - 3.0 m.p.h., 70% field efficiency

Planting - 4.5 m.p.h., 70% field efficiency

ACRE-HOURS FOR TILLAGE IMPLEMENTS AND OTHER EQUIPMENT

(continued)

Implement	Size	A/Hrs.	Hrs./A
Spike-tooth Harrow	12 ft.	5.24	0.19
	18 ft.	7.86	0.13
	24 ft.	10.47	0.10
Cultipackers	12 ft.	5.24	0.19
	15 ft.	6.55	0.15
Rotary Hoes	4 row	6.79	0.15
	6 row	10.18	0.10
	8 row	13.58	0.07
Sprayers	8 row	7.27	0.14
Planters	4 row con.	3.70	0.27
	4 row N-T	3.70	0.27
	6 row N-T	5.56	0.18
	8 row N-T	7.14	0.14
Combines @ 3 m.p.h.	4-30's	2.60	0.39
	6-30's	3.90	0.26
	8-30's	5.00	0.20

Formula used to determine the above figures:

$$\text{A/Hrs.} = \frac{\text{Speed (m.p.h.)} \times \text{Width (ft.)} \times \text{Field Efficiency (\%)}}{825}$$

Assumptions used for arriving at figures above:

Tillage - 4.5 m.p.h., 80% field efficiency

Spraying and cultivation - 4.0 m.p.h., 75% field efficiency

Harvesting - 3.0 m.p.h., 70% field efficiency

Planting - 4.5 m.p.h., 70% field efficiency

COST OF FARM SUPPLIES

	1985 Cost	Your Cost
Herbicides		
2,4-D Amine	$8.50 gal.	_____
Aquazine	5.50 lb.	_____
Attrex 4L	8.50 gal.	_____
Attrex 80W	1.80 lb.	_____
Banvel	56.00 gal.	_____
Basagran	82.00 gal.	_____
Bladex 4L	18.50 gal.	_____
Bladex 80W	3.60 lb.	_____
Blazer	78.00 gal.	_____
Dual 8E	50.00 gal.	_____
Fusilade	245.00 gal.	_____
Lasso	22.00 gal.	_____
Lorox 50W	5.75 lb.	_____
Lorox 4L	45.00 gal.	_____
Paraquat CL	45.00 gal.	_____
Princep 80W	2.80 gal.	_____
Prowl	25.00 gal.	_____
Roundup	84.00 gal.	_____
Sencor 4L	100.00 gal.	_____
Sencor 50W	11.00 lb.	_____
Tordon 10K	12.00 lb.	_____
Stickers	13.00 gal.	_____
Crop Oil	5.80 gal.	_____
Poast	95.00 gal.	_____
Eradicane	29.00 gal.	_____
Seed		
Oats	5.50 bu.	_____
Beans	12.00 bu.	_____
Corn	68.00/ 80,000 kernels	_____
Alfalfa	80.00 bu.	_____
Red Clover	60.00 bu.	_____
Wheat	7.50 bu.	_____

COST OF FARM SUPPLIES *(continued)*

	1985 Cost		Your Cost
Spreading			
Dry Fertilizer	$3.00/A	they do it	_____
Water and Herbicide	4.00/A	they do it	_____
Spreader	2.50/A	you do it	_____
Insecticides			
Dyfonate 20G	2.20	lb.	_____
Furadan 15G	1.70	lb.	_____
Lorsban 15G	1.50	lb.	_____
Sevin 50W	2.10	lb.	_____
Dry Fertilizers			
15-15-15	170.00	ton	_____
6-24-24	168.00	ton	_____
P 0-44-0	215.00	ton 25¢/lb.	_____
K 0-0-60	120.00	ton 11.5¢/lb.	_____
N 46-0-0	220.00	ton 24¢/lb.	_____
Lime	7.00	ton	_____
Liquid Fertilizers			
Liquid N, 28%	145.00	ton 26¢/lb.	_____
6-18-6	150.00	ton	_____
4-10-10	125.00	ton	_____

This list of farm supplies is provided as a *guide* for you and your students to use in preparing crop reports and budgets. These prices and products may vary from area to area in the state.

MARKETING DATA

	Prices - May 1986	Price Changes	New Crop Sept., Oct., Nov., Dec., 1986	Price Changes
GRAINS				
Corn	$2.10/bu	_____	$1.90/bu	_____
Soybeans	5.30/bu	_____	4.95/bu	_____
Wheat	3.70/bu	_____	3.20/bu	_____
Oats	1.10/bu	_____	———	———
Hay	60.00/ton	_____	———	———
LIVESTOCK AND POULTRY				
Steers	50¢/lb	_____		
Barrows and Gilts	52¢/lb	_____		
Lambs	74¢/lb	_____		
Broilers	42¢/lb	_____		
Eggs (large white)	51¢/doz	_____		
Turkeys	49¢/lb	_____		
Milk	$11.90/cwt	_____		